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FIRST ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

FROM THE DATE OF ORGANIZATION JULY 15, 1912,
TO DEC. 31, 1912.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.
1913.

Approved by
The State Board of Publication.

MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

Dec. 31, 1912.

CHARLES E. MONROE, *Chairman,*	Springfield.
BRIGGS S. PALMER, *Secretary,*	Lynn.
CHARLES J. COLLINS,	Boston.
WILLIAM H. REGAN, M.D.,	Cambridge.
ALBIE W. SYLVESTER, M.D.,[1]	Pittsfield.

[1] Appointed and awaiting confirmation by the council.

The Commonwealth of Massachusetts.

REPORT

Board of Registration in Optometry,
Boston, Dec. 31, 1912.

To His Excellency Eugene N. Foss, *Governor.*

Sir: — The Board of Registration in Optometry has the honor to present to Your Excellency its first report, from the date of organization July 15, 1912, to Dec. 31, 1912, as required by section 4, chapter 700, Acts of 1912.

The appointments to the Board of Registration in Optometry were made on June 29, 1912, as follows: Charles E. Monroe, Springfield, for a term of five years; William J. Daly, M.D., Boston, for a term of four years; Briggs S. Palmer, Lynn, for a term of three years; Dennis F. O'Connor, M.D., Worcester, for a term of two years; Charles J. Collins, Boston, for a term of one year.

On July 15, 1912, the Board assembled in Room 441, State House, Boston, having been duly sworn, and effected a permanent organization by the election of the following officers: chairman, Charles E. Monroe; secretary, Briggs S. Palmer.

The Board at once entered upon their official duties with energy and a conscientious desire to carry out the intents and purposes of the new optometry law in an efficient and thorough manner. A suitable system was effected and a definite policy adopted.

It was soon realized that there was a great amount of work to be done. The time required for this work compelled the members to neglect their own private practice to a considerable extent.

On July 29, 1912, Dr. William Daly, and on Dec. 12, 1912, Dr. Dennis F. O'Connor, finding the time taken was more than they could give, resigned from their position upon the Board. The remaining members of the Board deeply regretted that the doctors found it necessary to resign.

On Aug. 12, 1912, Dr. William H. Regan of Cambridge was nominated by the Governor to fill the vacancy caused by Dr. Daly's resignation. On Dec. 18, 1912, Dr. A. W. Sylvester of Pittsfield, was nominated to the position left vacant by the resignation of Dr. O'Connor.

The Board at an early date issued blank affidavits for candidates to fill in, certifying under oath the essentials that the Board should know relative to their status under the law, each affidavit to be attested by one physician and two reputable merchants.

The Board also issued a booklet of information, including a copy of the law and matters of interest relative to same. Seventeen hundred of these affidavits and booklets were mailed to those who were listed in optical directories and jobbers' lists as optometrists and opticians.

Eleven hundred and eleven have filed their affidavits properly filled out and sworn to, and as the time limit for filing affidavits for those who were in practice when the law went into effect expired Oct. 1, 1912, the remaining 589 apparently have discontinued the practice of optometry in the Commonwealth. We have positive information that some of these have left the State and have located in Connecticut, where there is no law regulating the practice.

A number of this migratory class had previously come into Massachusetts from neighboring States when laws similar to the Massachusetts act became operative, and now for similar reasons are leaving our borders for pastures new. A number have remained in the State and will apply themselves to the mechanical branch wholly, rather than attempt to qualify as optometrists and take the State Board examination.

In accordance with the law, the Board has classified the optometrists as follows: —

Those who were in practice the two years immediately preceding the passage of the act we have designated as "Class A."

Those enrolled under this head are required to show their competency by actual practical work, being obliged to examine subjects in the presence of Board members. The Board has a modern examining room equipped with all the paraphernalia requisite to an efficient, up-to-date examining room.

The class designated as "Class B" comprise those who were in actual practice in the State when the law went into effect, but had practiced less than two years prior thereto. The fact that they were in actual practice entitles them to be examined without preliminary educational qualifications.

The class designated as "Class C" comprise those who desire to commence the practice in the Commonwealth, not having been in actual practice at the time of the passage of this act. To be eligible for examination this class must have had a preliminary education equal to at least two years in a high school, and have studied certain specific, optometrical subjects for two years, or have graduated from a school of optometry maintaining a course of study of not less than two years.

Classes B and C are required to take a written examination in the following subjects: theoretic optics, practical optics, physiological optics, theoretic optometry, practical optometry, anatomy and physiology of the eye.

The examinations cover two days, from 9.30 A.M. to 12 M., and from 1.30 P.M. to 5 P.M. each day. A marking of 65 per cent. in each subject is required for a candidate to successfully pass.

The Board has held fourteen examinations. Two hundred and forty-four of Class A have been examined; 202 have been awarded certificates, and 42 failed to pass and have the privilege of again coming before the Board for examination. Forty-three of Class B have been examined; 36 successfully passed and 7 failed to qualify. Four of Class C have been examined; 4 successfully passed.

Realizing that legislation is operative only when enforced, the Board has taken every means available toward that end. Letters have been sent to optometrists throughout the State urging their active aid.

A copy of the law and letters of explanation are being sent to the authorities in every city and town in the Commonwealth asking for their co-operation. The members of the Board have personally investigated the moral and business status of candidates already examined. A number of candidates have been summoned to appear before the Board and testify under oath, but the Board has felt for some time that a trusted agent, who could devote his entire time and energy to the work of investigating doubtful cases and of obtaining evidence against violators of the law, would prove a more economical and efficient means. The Board has secured the services of an agent of unimpeachable character and known ability, who entered upon his duties Dec. 30, 1912.

Although the law has been in effect practically but three months (the time limit for filing affidavits expiring Oct. 1, 1912), the law has already proven the claim of its sponsors, that it would be of benefit to the inhabitants, eliminate the fakir and grossly incompetent, and raise the standard of service.

The fake advertising in the State has been almost entirely abandoned. The Board has a carefully compiled list of optical advertising before and after the law became operative, and the comparison is remarkably suggestive. Many of the optometrists have added to their office equipment, and have taken special courses of instruction to enhance their knowledge.

Two men have been arrested for practicing without being registered. One received a jail sentence, the other had his case continued for three months, during which time he was enjoined by the court not to practice. As he has apparently broken his probation he will again be hailed into court in contempt proceedings.

One man of doubtful skill and unscrupulous in his dealings, who used most reprehensible methods in his practice, was refused a right to practice, and in spite of threats and rebellion against the provisions of the law, the Board compelled him to take down a very elaborate sign and discontinue his practice, and he has since taken up an entirely new line of business.

Another person of doubtful methods, one who has done a great deal of damage for a number of years past by carrying on a nefarious business, unrestrained and unchallenged, has left this Commonwealth. It may be of interest to you to know to what extent men of this class will go without a restraining law and some one to enforce it.

A school girl was fitted to glasses by this person and was given a certain treatment to strengthen her eyes, viz., she was to read from the Bible two hours a day, that through the influence of the Holy Word and his wonderful medicated lenses her sight might be made perfect. He collected a deposit of $10, and later sent in a bill for $76 for treatment.

The Board refused to accept this man's affidavit, and informed him that if he continued his unlawful work in Massachusetts, the Board would prosecute him. He now has a regular established office in a Connecticut town, Connecticut being the only State in

New England not having a protective law against such practice. The common law against fraud is an easy one for men of his class to elude, whereas an optometry law such as Massachusetts now has upon the statute books, makes it impossible for any but accredited practitioners to continue.

These instances are but a few of the many we have compelled to either change their business or leave the State. The law has also made it possible for the Board to compel more truthful advertising.

One firm has advertised for a long period that they employed 6 eyesight specialists. Upon investigation we found they had but 4 who had filed affidavits, and these not yet granted a certificate, and the Board in consequence compelled the discontinuance of this deceit.

The Board has sent agents who secured glasses from those firms who were advertising $5 glasses for $1, etc., and the Board demanded a change in their methods. In consequence, much of the extravagant claim advertising has been eliminated.

We have asked for and obtained the Attorney-General's ruling upon doubtful questions of law, so that at all times we have proceeded in accordance with the highest legal advice. It is the purpose of the Board to administer the law with justice and without fear or favor, to the end that the Commonwealth may be purged of itinerant quacks and the grossly incompetent. Standards of efficiency are being raised in order that all the inhabitants may be assured skilled service in a calling that in the past has harbored too many unscrupulous incompetents because of the absence of State regulation and supervision.

It will be observed by the financial report that the enforcement of the optometry law is entirely self-supporting, and that the benefits accruing to the inhabitants of the Commonwealth under it add nothing to the public burden.

FINANCIAL REPORT.

Receipts.

Received from 437 applicants for examination, .	$10,925 00	
Interest on bank account, ...	3 95	
Total amount paid to Treasurer of Commonwealth, .		$10,928 95

Expenditures.

Cash paid for compensation and railroad expenses of commissioners, ...	$2,961 42	
Cash paid for clerical force and general office expenses, ...	706 17	
		3,667 59
Unexpended balance in hands of State Treasurer, . .		$7,261 36

The above bills have been approved by the State Auditor.

Respectfully submitted,

CHAS. E. MONROE, *Chairman.*
CHARLES J. COLLINS.
BRIGGS S. PALMER, *Secretary.*
WILLIAM H. REGAN, M.D.

Public Document No. 97

SECOND ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

December 1, 1912, to November 30, 1913.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1914.

The Commonwealth of Massachusetts.

REPORT.

Board of Registration in Optometry,
Boston, Nov. 30, 1913.

To His Excellency Eugene N. Foss, *Governor*.

Sir: — The Board of Registration in Optometry has the honor to present to Your Excellency its second annual report, as required by section 4, chapter 700, Acts of 1912. The last annual report was to Dec. 31, 1913, but wishing to have the fiscal year terminate November 30 to conform to the State fiscal year, the present report covers the period from Dec. 1, 1912, to Nov. 30, 1913.

In accordance with the law the Board previously classified the optometrists under three heads. Those who were in practice two or more years immediately preceding the passage of the act were designated as "Class A." Persons enrolled under this head were given by statute until June 1, 1914, to qualify before the Board, providing their affidavits had been filed in due time, found to be true to fact and accepted by the Board.

Those who were in practice at the time of the passage of the act, but who had not practiced two years, were designated as "Class B." Persons in this class were entitled to take the regular written examination, not being obliged to submit evidence of any preliminary education, but were required to qualify before the Board immediately without the extension of time allowed the older practitioners under Class A.

Persons who make application for the right to commence the practice of optometry in the Commonwealth are designated as "Class C." Any one accepted in this class must have submitted an affidavit, together with other evidence verified by oath, that he is over twenty-one years of age, of good moral character, has had a preliminary education equivalent to at least two years in a public high school, and has studied certain prescribed subjects for at least two years, or has graduated from a school of optometry maintaining a course of study of not less than two years, and shall pass an examination in theoretic, practical and physiological optics, theoretic and practical optometry, and in the anatomy and physiology of the eye, and shall then be registered and receive a certificate. All examinations after June 1, 1914, will be under Class C.

The Board has examined 518 Class A applicants. Three hundred and seventy-four successfully passed on the first examination given them this year, and 144 failed in their examination. Many of those who failed to fully satisfy the Board as to their competency entered into a course of special study and instruction, and took subsequent examinations. Of the 144 who failed, 70 were later re-examined, 35 of them being successful, making the total for the year of persons in Class A who were passed 409, and those who failed 109.

The Board has held three regular written examinations for Class C applicants. February 11 and 12, 13 candidates were examined. The examinations covered two days, from 9.30 A.M. to 12 M., and from 1.30 P.M. to 5 P.M. each day. Twelve passed and 1 failed. June 10 and 11 the Board examined 12 candidates, the examinations covering two days. Ten passed and 2 failed. November 11, 12 and 13, 9 were examined, the examinations covering the greater part of three days. Seven passed and 2 failed. Among these Class C candidates were 6 graduates of the Columbia University College of Optometry. All but one of the Columbia graduates successfully passed the examination. The following questions were given in the November Class C written examination: —

Theoretic Optics.

By Charles E. Monroe.

1. Explain the meaning of: —

(*a*) The pole.
(*b*) The center of curvature.
(*c*) The aperture.
(*d*) The principal axis.
(*e*) The secondary axis.
(*f*) The principal focus.
(*g*) The focal distance.
(*h*) The conjugate foci of a spherical concave mirror.

2. Give the laws of: —

(*a*) Refraction.

(*b*) Reflection.

3. Write a thesis on light.

4. How would you find the principal focal length in inches of a plus 8.00 diopter lens?

5. If an object is placed 12 inches in front of a plus lens whose focal length is 6 inches, where will the image be and what are the two points called?

6. If the angle of incidence is 45 degrees, what will be the angle between the incident and the reflected ray?

7. Where must an object be placed to obtain a real image four times the size of the object, using a plus 2.50 diopter sphere?

8. What must be the character of the incident rays of light in order that they may focus on the retina?

(*a*) When the retina is situated nearer than the principal focus of the dioptric system?

(*b*) When the retina is situated beyond the principal focus of the dioptric system?

9. Holding a plus 3.50 dioptric spherical lens, 16 inches in front of a lighted candle, where will the image be formed?

10. The image of a small distant source of light is formed on a white screen by means of a convex spectacle lens. When the lens is tilted so that it is inclined at an angle of 45 degrees toward the direction of the incident rays, there are two positions in which the image takes the form of a luminous straight line. Explain this.

11. A sphero-cylindrical lens, the formula plus 4.00 diopter spherical combined with a minus 2.00 diopter cylinder, axis 90, is 2 inches in diameter; a parallel beam of light passes through this lens; find the height and width of the oval patch which is cast on a screen 5 inches distant.

12. What is the refractive index of a plano concave lens of 2.00 diopters, the radius of curvature being 25 centimeters? How do you make the calculation?

Practical Optics.

By Briggs S. Palmer.

1. Explain by diagram the different kind of lenses and what each is used for.

2. Name three different kinds of glass and the index of refraction of each.

3. Given case required plus 4.00 sphere combined with 2 degrees of prism base in O.U. for reading. How much would each lens be decentered?

(*a*) Give rule for decentering.

4. Give rule for transposing lenses marked in diopters into inches.

(*a*) What is dioptric power of these lenses: 54 inch, 17 inch, 11 inch, 28 inch, 2¾ inch.

5. (*a*) What is rule for transposing compound lenses when signs are unlike and the spheres are greater than the cylinders?

(*b*) Transpose the following: —

Plus 1.00 sphere combined with minus .50 cylinder axis 180.
Plus 4.00 sphere combined with minus 2.25 cylinder axis 30.
Plus 2.00 sphere combined with minus 2.00 cylinder axis 45.
Minus 3.00 sphere combined with plus 1.00 cylinder axis 80.
Minus 3.25 sphere combined with plus .37 cylinder axis 15.

(*c*) Tranpose these cross cylinders: —

Plus 1.00 cylinder axis 90 combined with minus 1.00 cylinder axis 180.
Plus 1.25 cylinder axis 110 combined with minus .75 cylinder axis 20.

6. An unknown lens required a plus 4.00 to neutralize the vertical meridian and minus 2.25 to neutralize the horizontal meridian. Write three prescriptions for this compound.

7. (*a*) What are the points to which attention must be directed in frame fitting, both for spectacles and eyeglasses?

(*b*) What difference would you make in the adjustment between a frame for reading and one for shooting?

8. Give the toric form with both a plus 6 curve and minus 6 base curve for the following: —

(*a*) Plus 1.00 diopter sphere combined with plus 2.00 diopter cylinder axis 85.

(*b*) Plus .50 diopter sphere combined with minus 3.00 diopter cylinder axis 180.

(*c*) Plus 1.00 diopter sphere combined with plus 1.50 diopter cylinder axis 45.

(*d*) Minus 2.00 diopter sphere combined with plus 3.00 diopter cylinder axis 120.

(*e*) Plus .75 diopter sphere combined with .50 diopter cylinder axis 75.

9. Give three causes of the cutting of the nose by a spectacle bridge. How can the trouble be overcome?

(*a*) Explain how an eyeglass guard must be adjusted in order to give the most security and comfort. Name two results of poor eyeglass adjustment.

10. (*a*) How is the optical center of a spherical lens found? Show by diagram.

(*b*) How do you find and mark the axis of a cylindrical lens? Show by diagram.

(*c*) With a P.D. of 60 millimeters and 20 millimeters taken up by the bridge, how can a lens 42 millimeters long be given and still be correctly adjusted? Explain fully.

11. Fully describe how bifocal lenses should be adjusted, and the position the wafer or reading part should occupy.

12. What curvature must be given to the two surfaces of a wafer to produce a 2.50 diopter reading addition, the distance correction being plus 1.00 diopter cylinder, the lenses to be made toric on a plus 6.00 diopter base curve?

PHYSIOLOGICAL OPTICS.

BY ALBIE W. SYLVESTER, M.D.

1. Name the refracting surfaces and the refracting media of the eye.

2. What and where are the anterior and posterior principal foci, and the anterior and posterior nodal points as applied to the dioptric system of the eye?

3. Define visual angle, minimum visual angle and visual acuity.

4. Define angle gamma.

5. Define astigmatism. Name and define five varieties of regular astigmatism.

6. Define accommodation and convergence and explain how they are related.

7. Explain near point and far point: —

(*a*) As applied to the emmetropic eye.

(*b*) As applied to the hypermetropic eye.

8. Define binocular vision and diplopia, and explain by diagram homonymous and heteronymous diplopia.

9. Define abduction, adduction and sursumduction, and state their ratio.

10. Define orthophoria, orthotropia, hyperphoria, hypertropia, exophoria, exotropia.

11. Define ametropia, emmetropia, asthenopia and anisometropia.

12. Define cataract and aphakia. How do you diagnose each?

THEORETIC OPTOMETRY.

BY CHARLES E. MONROE.

1. Name and describe the essential instruments needed in an optometrist's office.

2. State how ocular refraction can be measured by means of an ophthalmoscope.

3. Write a thesis on retinoscopy.

(*a*) Dynamic.

(*b*) Static.

4. What theory underlies the use of the "cover" test in determining heterophoria?

5. What theory underlies the "fogging" system in a subjective examination of the eye?

6. What is meant by minimum and maximum convergence, and how determined?

7. What is indicated in retinoscopy by the shadows appearance?

(*a*) Its form.

(*b*) Its speed.

(*c*) Its intensity.

8. Illustrate by diagram and describe Scheiner's subjective test for ametropia.

9. Describe the test for heterophoria.

(*a*) At 6 meters.

(*b*) At 33 centimeters.

10. How can you prove with a plane retinoscope, a tape measure and a plus 5.00 diopter sphere, that the patient is hyperopic 3.00 diopters?

11. Explain the paralax test for determining the nature of a muscle imbalance.

12. Explain the theory of the pinhole disc test.

PRACTICAL OPTOMETRY.

By Bernard H. Whitney.

1. Explain static and dynamic retinoscopy.

(*a*) Explain how you would find simple myopic and hypermetropic astigmatism, and compound hypermetropic astigmatism with plane retinoscope by the static method.

(*b*) In testing a child ten years of age by dynamic retinoscopy plus 3.00 diopter O.U. appears to neutralize the movement during fixation at 40 inches. What would the amplitude of accommodation be, and the near point without glasses?

2. Explain the ophthalmometer and its uses.

(*a*) What is astigmatism with the rule?

(*b*) What is astigmatism against the rule?

(*c*) If ophthalmometer shows 2.00 diopters of astigmatism with the rule, how much would you expect to find subjectively?

(*d*) If ophthalmometer shows ½ diopter against the rule, what would you expect to find subjectively?

3. Explain the direct and indirect methods of using the ophthalmoscope.

(*a*) What is oblique illumination and its uses?

4. How do you take duction tests at distance and near points?

(*a*) What is meant by exercising muscles, and how is it accomplished, including the ciliary muscle?

(*b*) Describe the double prism and its uses.

(*c*) What effect on an eye has a 5-degree prism base down?

5. What is the rule in prescribing for a case of hyperopia with exophoria?

(*a*) In hyperopia with esophoria?

(*b*) In myopia with esophoria?

6. Explain the stenopaic slit.

(*a*) In a given case requiring right plus 1.00 sphere combined with minus 2.00 cylinder axis 30, state how and what lenses would be used in getting this result with the stenopaic slit.

7. Explain the fogging system in detail.

(*a*) In what cases is the fogging system of no value?

(*b*) Why is the axis of the cylinder placed at right angles to the blackest lines on the astigmatic chart?

8. How do you measure the amplitude of accommodation, and the amplitude of convergence?

(*a*) Describe the perimeter and its uses.

9. In testing the oblique muscles at near point with double prism over right eye and left eye fixing on a single horizontal black line, patient sees three lines. The center line is found converging toward the lower line at the right. What kind of cyclophoria would this be?

10. In a given case we find on distance test esophoria. In taking the duction test of the external recti muscles we find a total strength of 2 degrees. In correcting this case would you be governed by the amount of the esophoria, or the strength of the externals?

(*a*) In what form of ametropia is pseudo-esophoria more often present and why?

(*b*) On a given case you find at distance no refractive error or muscular imbalance. At near point 10 degrees of exophoria is present. Duction tests show all muscles normal. How would you explain the presence of the exophoria?

11. Draw a diagram of the position of the eyes in orthophoria, hyperphoria, esophoria and exophoria.

(*a*) Will exophoria wholly muscular, with all innervation centers normal, show the same number of degrees at the near point as at distance?

(*b*) In examining do you usually find that a hyperphoria of one eye is associated with a cathaphoria of the other?

(*c*) How many degrees of pseudo-esophoria would you expect to find for each diopter of uncorrected hypermetropia?

12. Give a detailed account of your entire procedure in making an examination of the eyes, also records you would make, and write out a prescription involving spherical, cylindrical, compound and prismatic lenses.

(*a*) What is the effect of a pair of reading glasses plus 8.00 diopter, for example, setting farther away from the eyes than they were in the trial frame during the examination?

ANATOMY.

By William H. Regan, M.D.

1. (*a*) Name intrinsic and extrinsic muscles of the eyeball.
(*b*) Nerve supply of each.
2. Name tunics of the eye and describe each.
3. How many layers has retina, cornea?
4. Describe iritis and causes.
5. Describe glaucoma and its causes.
6. Describe interstitial keratitis and cause.
7. Describe amblyopia exanopsia and cause.
8. What is a cataract? Causes and kinds?
9. What is trachoma?
10. Name straight external muscles of eyeball.
11. Describe spaces of Fontana.
12. Describe humors of the eye.

Physiology of the Eye.

By Albie W. Sylvester, M.D.

1. Name the motor muscles of the eyeball and give the nerve supply and specific action of each.

2. Name the different parts of the lacrymal apparatus, state their various functions and the functions of the tears.

3. What are the functions of the lids, lashes and Meibomian glands?

4. What are the functions of the iris, ciliary body and the crystaline lens?

5. Describe the complex phenomenon manifested in paralysis of the third cranial nerve.

6. Describe and explain in full the physiologic process of convergence.

7. What are the functions of the aqueous and vitreous humors, sclera, and choroid?

8. What are the functions of the orbital fat, Tenon's capsule and the conjunctiva?

9. Explain, physiologically, dilatation and contraction of the normal pupil.

10. (*a*) What direct and reflex stimuli cause contraction of the pupil?

(*b*) What direct and reflex stimuli cause dilatation of the pupil?

(*c*) What effect has psychic stimuli, such as fright, anger, etc., have on the size of the pupil?

(*d*) What influence has age and refractive errors on the size of the pupil?

11. How is the normal intra-ocular tension regulated and maintained?

12. What are the functions of the retina, the pigment of the eye, and the optic nerve?

The Board requires that ten questions be answered in each of the above subjects, and a marking of 65 per cent. is necessary to pass in each.

Realizing that it is often true that candidates are able to successfully pass a theoretical examination without possessing the practical knowledge essential to a well-equipped practitioner, the Board will demand even higher qualifications in the future, and in addition to a comprehensive written examination covering theoretic and practical subjects, will require a satisfactory demonstration of their knowledge of the ophthalmoscope, ophthalmometer, retinoscope and other necessary instruments.

Candidates will be obliged to satisfy the Board that they possess skill in the use of the static and dynamic methods of skiametry, and a clear conception of the "fogging system," that the Board may be sure that men registered in Massachusetts are properly equipped with theoretic and practical knowledge essential to examine illiterates and children, and the most difficult cases of refraction, accurately and scientifically. They will also be expected to demonstrate their ability in frame fitting, neutralizing lenses and the transposition of lens formulæ.

The Board has held during the year 51 executive sessions. Seventy-four days have been devoted to the examination of candidates, and a large number of hearings have been given. Four thousand nine hundred letters have been sent from the Board office during the year. At the hearings witnesses were duly sworn and a record kept of testimony given.

In one case charges were preferred against an optometrist for gross incompetence. The accused was represented by counsel and four witnesses were duly sworn and testified. The complaint was not sustained, as it was proven that the accused had merely shown poor judgment in this particular case, and that he had some 4,000 prescriptions and had never before been complained of. Physicians testified that they had found him reliable and conscientious in his work.

A number of hearings were given to men who had previously traveled from house to house examining eyes. While most of them seem to be honest in their purpose, the practice is so unprofessional and so plainly open to criticism that the Board has frowned upon such methods of soliciting business, and has advised the very few who were following this custom to discontinue such practice. It is gratifying to note that they have promised to discontinue within a specified time.

A few were requested to appear for a conference relative to the use of extraneous titles, it being the desire of the Board that all use the term "optometrist," and that no other appellation be affixed or prefixed to the name. The Board has reason to believe that its wishes in this matter will be respected.

A number of hearings have been held relative to extravagant and misleading advertising, it being the policy of the Board to eliminate all questionable methods.

Several hearings were given to one who felt that the Board was unwarrantably severe in its ruling on his case. After careful consideration of the facts, the Board refused him the right to practice because of moral and professional irregularities.

Hearings were given to men who had been accused of questionable and unethical procedure in their practice. The law which allows the Board broad discretionary powers has enabled it to regulate certain phases of optometrical practice not specified in the statute, and in many instances the Board has accomplished the desired end by diplomacy and moral suasion without resorting to legal procedure.

While the Board has employed one and sometimes two agents, and Board members have been alert and active in the investigation of cases, it is possible that there are still some existing irregularities. A great amount of routine work has largely occupied the attention of the Board; but now, as the regular recorded men have been investigated, more time is being devoted to unearthing violations of the law. Evidence has recently been secured against a number who are practicing optometry illegally and prosecutions will shortly follow. Three firms without registered or recorded men have displayed conspicuous signs claiming to examine eyes, but when asked to make an examination would send the person to a certain practitioner and receive a commission therefor. Needless to say this deception has been stopped by the Board.

One man who was tried and convicted of practicing optometry without being registered was put on parole and instructed by the court to appear before the Board of Optometry, but he has defaulted and there is now a warrant out for his arrest.

The following case is one of especial interest, showing as it does the value of the optometry law to the people of the Commonwealth, it having been the means of driving from the State a charlatan whom no law could apparently reach. This man claimed to be a magnetic healer, and had been engaged in his nefarious business for many years. He advertised widely and extravagantly as to what he could accomplish by his wonderful healing power.

The fact that his charges were exorbitant and his clientele drawn largely from the poorer classes, who received practically no benefit from his treatment, stamped his practice as an especially deplorable one. He used no drugs and could not be prosecuted for practicing medicine, an effort having been made to do so without result; civil suits were brought against him, but these were either settled out of court or placed indefinitely on file. After having been located in a Massachusetts city for some five months he published an article in which he advertised that he used a well-known instrument for examining eyes. A member of the Optometry Board with another, called upon him for an examination as he was not registered under the law.

After the professor had made a pretence of making an eye examination, a warrant was sworn out for his arrest for attempting to practice optometry unlawfully. He was arrested and convicted and fined $100, which he paid. The professor was immediately rearrested on another charge and placed under bond which he defaulted, and has never been seen in Massachusetts since. Thus the new optometry law has proven its worth by eradicating an evil where all other laws were acknowledged to be impotent.

In the last annual report the Board made no recommendation for further legislation, and still feel that the present law is adequate for regulating the practice of optometry efficiently and economically.

The Economy and Efficiency Commission requested the Board's opinion as to the advisability of having the legal matters of the Optometry Board, in common with certain other commissions, controlled by a central legal department under the State Board of Health, and the Board's opinion was expressed as follows: —

The Board of Registration in Optometry feels that its own affairs can be more efficiently managed, and the welfare of the public better conserved, if the Board is left free to exercise its prerogatives and carry out the provisions of the law under the present existing legal machinery for the following reasons: —

First, the law to regulate the practice of optometry, chapter 700, Acts of 1912, is a self-sustaining law. The latter part of section 7 reads: "expenses incurred by the board under the provisions of this act shall be approved by the board and paid by the commonwealth, but only to the amount paid over by the board. No money in excess of the amount paid over shall be paid by the commonwealth." You will note by this clause that the enforcement of the law governing the practice of optometry costs the State nothing.

Second, under the provisions of the law the Board has been able to bring violators to justice with greatest possible dispatch. To relegate our legal affairs to the jurisdiction of some other department or board, having a large legal budget to dispose of, with unknown possibilities of delay, when at present we have the funds, the law and the ability to accomplish desired results quickly, economically and efficiently, would seem very unwise.

Third, the practice of optometry does not concern either medicine, drugs or sanitation, dealing only with mechanics and physical science, and, strictly speaking, should not be under control of those interests having to do with public health laws.

For the reasons above stated, and others unexpressed at this time, the Board of Registration in Optometry respectfully asks that in drawing up your petition for legislative action toward the establishment of a legal department, your honorable commission leave out the Board of Registration in Optometry, as it has ample means and ability to administer the law regulating the practice of optometry. The Board is to some extent responsible for the successful outcome of the measure, the purposes of which in the past have been more or less misunderstood, and feels that it should be unhampered in its efforts to accomplish desired results.

There has been considerable discussion in and out of the optometrical profession as to whether the sale of cheap ready-made glasses over the counter as merchandise should be prevented by law, when no attempt is made to assist the purchaser in selecting the glasses. It is rather a pernicious custom and the Board would be pleased to see it discontinued.

The question has been raised, "If the custom of selling drugs (in original packages) as merchandise is allowed, why should not the sale of ready-made glasses as merchandise be permitted?" The Boston Dispensary has recommended in a recent report that the selling of glasses over a counter as merchandise be prevented by law, and placed under the control of the Board of Registration in Optometry or some other board.

If such a law were enacted it would seem to the Board that police supervision rather than any board or commission should be held responsible for its enforcement, as it would be a matter of controlling the sale of merchandise and not the regulation of the practice of a scientific body of men. The Board is willing, however, to assume the duty of supervising the sale of glasses as merchandise, if the Legislature pass a law giving the Board the necessary power.

Some feel that this evil is gradually being eliminated by an intelligent public. It was not many years ago that the common custom was to select one's own glasses ready made; but as scientific methods of examining eyes were introduced, and the people became educated, the practice has become more and more obsolete. The changing sentiment against the sale of eyeglasses as merchandise is clearly demonstrated by the nation-wide protest made to the Panama-Pacific Exposition officials against the granting of a concession for the sale of eyeglasses. The objection was so powerful and insistent that in spite of the fact that it has been the custom in the past for all exposition managements to grant eyeglass concessions, and that it involved the loss of more than $60,000, those in authority have refused to grant any eyeglass concession whatever.

In September, Bernard H. Whitney of Dedham was appointed to the Board by Your Excellency, and confirmed by the Council to succeed Charles J. Collins, whose term of office expired at that time.

The Board held its annual meeting Oct. 14, 1913, at which time Charles E. Monroe was re-elected chairman, and Bernard H. Whitney secretary for the ensuing year.

The Board wishes to express its appreciation of the faithful and efficient services of the retiring secretary, Briggs S. Palmer.

FINANCIAL REPORT.

Receipts.		
Unexpended balance in hands of State Treasurer Jan. 1, 1913,	$7,261 36	
Received from 351 applicants for examination,	8,775 00	
One re-examination fee,	5 00	
Interest on bank account,	8 93	
		$16,050 29
Expenditures.		
Cash paid for compensation and railroad expenses of commissioners,	$6,256 30	
Cash paid for clerical force and general office expenses,	4,574 87	
		10,831 17
Unexpended balance in hands of State Treasurer,		$5,219 12

Respectfully submitted,

CHARLES E. MONROE, *Chairman.*
BERNARD H. WHITNEY, *Secretary.*
WILLIAM H. REGAN, M.D.
ALBIE W. SYLVESTER, M.D.
BRIGGS S. PALMER.

Public Document No. 97

THIRD ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

November 30, 1913, to November 30, 1914.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1915.

Approved by
The State Board of Publication.

MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

Nov. 30, 1914.

1917. CHARLES E. MONROE, *Chairman,* 374 Main Street, Springfield.

1918. BERNARD H. WHITNEY, *Secretary,* 8 Winter Street, Boston.

1919. JOHN J. BRENNAN, M.D., 336 Slater Building, Worcester.

1916. WILLIAM H. REGAN, M.D., 15 Beacon Street, Boston.

1915. BRIGGS S. PALMER, 149 Tremont Street, Boston.

The Commonwealth of Massachusetts.

REPORT.

BOARD OF REGISTRATION IN OPTOMETRY,
BOSTON, Nov. 30, 1914.

To His Excellency DAVID I. WALSH, *Governor.*

SIR: — The Board of Registration in Optometry herewith submits to Your Excellency its third annual report as required by chapter 700, Acts of 1912.

Under the provisions of the optometry law persons who had been in practice two or more years immediately preceding the passage of the act were given by statute until June 1 of this year to qualify before the Board. Such persons were designated by the Board as "Class A." From November 30, the time of the last report, to June 1 the Board examined 313 Class A applicants. Of these, 138 successfully passed on the first examination given them this year and 101 failed. Of the number that failed, 64 were later re-examined, 50 being successful in passing, making a total, for the above period, of 188 persons who qualified under Class A, and of 91 who failed. Under Class A 1,056 examinations have been given since the passage of the law; 790 persons were successful in qualifying after one or more examinations prior to June 1, when the Class A privilege terminated.

It is interesting to note in this connection that of the 1,700 men who received affidavit blanks from the Board when the law went into effect, but 1,111 filed affidavits as provided by statute. It is evident, therefore, that 589 men who had previously examined eyes realized that the new law demanded standards which they were unable to meet. Of the remaining 1,111 the Board accepted the affidavits of 1,079 after careful investigation, and of this number 790 qualified. Seventy-nine new men have commenced the practice since June 1, 1912, and at present there are 874 persons registered to practice optometry in Massachusetts, including the five original appointees to the Board, who received certificates of registration by virtue of their appointment.

The Board has held three regular examinations for persons desiring to commence the practice. On February 10, 11 and 12, 4 candidates were examined; 2 passed and 2 failed. On June 9, 10 and 11 the Board examined 12 candidates; 2 passed and 10 failed. On November 10, 11, 12 and 13, 16 were examined; 10 passed and 6 failed.

The following questions were given at the November examinations: —

THEORETIC OPTICS.

BY CHARLES E. MONROE.

1. Illustrate by three simple diagrams the laws of reflection for a luminous point centrally placed before a plane, a convex and a concave mirror, respectively.

2. What is the focal length of the following lenses placed in apposition? + 4.00 sph., + 3.00 sph. = − 2.00 cyl. axis 75°, + 3.50 sph. = + 1.00 cyl. axis 75°, − 2.00 sph., − 4.50 sph., − 1.00 cyl. axis 165°?

3. Define principal focus, ordinary focus and conjugate foci.

4. At what distance will parallel rays be focused by a concave mirror whose radius of curvature is 17 inches? Give rule for working similar examples.

5. The light from a candle passes through a + 3.00 D. sph. at 50 centimeters. Where should a screen be placed to get the best defined image? Use the calculation.

6. In what way does chromatic aberration differ from spherical aberration?

7. When light comes in contact with a body what three things happen to it?

8. What is light and how does it manifest itself?

9. The image of a small distant source of light is formed on a white screen by means of a convergent spectacle lens. When the lens is tilted so that it is inclined at an angle of 45° to the direction of the incident rays there are two positions of the screen in which the image takes the form of a luminous straight line. What is the explanation?

10. An object of 1/8 inch in height is placed on the principal axis of a convergent lens of 10-inch focal length. Determine the position, size and character of the image (real or virtual, erect or inverted) when the

distance from the lens to the object has the following values: (*a*) 30 inches; (*b*) 20 inches; (*c*) 5 inches.

11. A certain lens focuses parallel rays of light at 20 centimeters. What lens must be placed in front of it to send the focus back to 1 meter?

12. A coin 1 inch in diameter is held 12 inches from a lens which has a principal focus of 4 inches. Where will the image be formed and what will be its size? Show the calculation.

PRACTICAL OPTICS.

BY BRIGGS S. PALMER.

1. (*a*) An order for a pair of lenses is as follows: O. U. + 6.00 = + 1.00 cyl. axis 90°, decenter 3 millimeters in. Would this be base out, or base in, and why?

(*b*) What is the strength of the prism produced by this decentration?

(*c*) Give rule for decentering.

2. (*a*) What two facts determine the power of lenses?

(*b*) In the lenses of the trial case, what relation has the principal focus of each lens to the power marked on the handle of the lens? Give some examples.

3. (*a*) In what two ways can the power of a prism be determined?

(*b*) What is the relation of the prism dioptry to the lens power?

4. Explain the terms: —

(*a*) Optical center.

(*b*) Mechanical center.

(*c*) Name and describe four kinds of bifocal lenses.

5. Transpose the following into torics on both a minus and plus, 6 base curve, giving the curves for each side: —

(*a*) + 1.00 sph. = — 2.00 cyl. axis 180°.

(*b*) — 3.00 sph. = — 1.00 cyl. axis 45°.

6. (*a*) What is the curvature of the two surfaces of a periscopic lens of + 2.00 D. power?

(*b*) What would be the power of each surface of a + 2.00 bifocal segment to be fitted to the above lens?

7. What is meant by the index of refraction?

8. (*a*) What is meant by neutralizing a lens? Give an example.

(*b*) What is meant by the axis of a cylindrical lens?

9. What is the advantage of the metric system of numbering lenses?

10. (*a*) Why should the optical centers of a pair of lenses for close work be 2 to 3 millimeters nearer together than the optical center of lenses for distance vision?

(*b*) What particular advantage has the meniscus form of lens for bifocal glasses?

11. In what way does crown glass differ from flint glass as to dispersion and refraction index?

12. How should glasses be adjusted so as to serve for both distance and reading?

PHYSIOLOGICAL OPTICS.

BY ALBIE W. SYLVESTER, M.D.

1. Define visual acuity, binocular vision, homonymous diplopia and right hyperphoria.

2. Define and explain the terms: principal foci, nodal points, center of rotation, optic axis, visual line, visual angle and angle gamma.

3. Name and describe three errors of refraction which require a different character of compound lens for correction. Draw diagrams to illustrate each condition.

4. Define cataract and aphakia. How do you diagnose each? What is the refractive condition of an aphakic eye that was originally myopic, say, 4.00 D.?

5. Define accommodation, amplitude of accommodation, spasm of accommodation and paralysis of accommodation.

6. Name the refracting surfaces and the refracting media of the eye.

7. Define hypermetropia. Explain in detail the terms: manifest, latent and total hypermetropia. How are each estimated? What is the character of the correcting lens?

8. In a case of amblyopia, how would you tell whether it was due to opacity of cornea, lens or vitreous; or to optic nerve atrophy or to amblyopia exanopsia?

9. Define the following varieties of astigmatism: regular, irregular, with and against the rule, corneal, lenticular, symmetric and asymmetric.

10. Define near point, far point, amplitude of accommodation and amplitude of convergence.

11. Define anisometropia, asthenopia, amblyopia and amaurosis.

12. Define abduction, adduction and strabismus. Name and define three varieties of strabismus.

THEORETIC OPTOMETRY.

BY CHARLES E. MONROE.

1. Write a thesis on the instruments used in an optometric examination of the eyes, giving construction and principles involved in each.

2. In theory what is the kind and amount of ametropia in dynamic skiametry, the eye fixing on an object 40 inches and reversal found in all meridians at 26 inches?

3. With the retinoscope--static method--and 40 inches as the working distance a + 2.00 D. sph. neutralizes the shadow movement. What two points are conjugate, and what is the patient's correction?

4. What is the accepted rule for correction in the following cases: —

(*a*) Hyperopia with esophoria.

(*b*) Myopia with exophoria.

5. In the examination for muscle imbalance what is determined by: (*a*) The cover test? (*b*) The parallax test? Explain fully.

6. In cases of high ametropia, by what means may a prognosis of an improvement in vision be made without the use of lenses?

7. What principles are involved in the examination with the ophthalmoscope?

(*a*) Direct method?

(*b*) Indirect method?

8. What would be the prescription for distance in each of the following retinoscopic findings: —

(*a*) Working distance 16 inches, static method, patient twenty years of age. Point of reversal is reached with a + 2.00 D. sph. — 1.50 D. cyl. axis 180°.

(*b*) Working distance 40 inches, dynamic method, patient twenty years of age. Point of reversal is reached with a + 2.00 D. sph. = — 1.50 D. cyl. axis 180°.

9. If a + .50 sph. gives best vision on the horizontal lines of astigmatic fan, and + 1.00 sph. gives best vision on the vertical lines, what is the prescription for the correcting lenses, and different ways of writing it?

10. With a prism base down before the left eye, the upper image is to the left of the lower image.

(*a*) What is the name given to the condition?

(*b*) Why does the eye deviate?

(*c*) Where would you place the base of the correcting prism?

11. What is the dioptric power of the lens required to be placed before the static myopic eye of 1.00 D. in order that an aerial image of its illuminated fundus shall be produced 20 centimeters in front of the eye?

12. Give the reasons why strong contrageneric lenses of the same power fail to neutralize each other.

(*a*) What convex lens exactly neutralizes a — 20.00 D. lens?

(*b*) Which is the standard, minus or plus, in the trial case from which the opposite is made to conform in neutralization?

Practical Optometry.

By Bernard H. Whitney.

1. State fully your procedure in making an examination —

(*a*) By dynamic retinoscopy.

(*b*) By static retinoscopy.

2. State briefly your procedure —

(*a*) In testing for muscular imbalance at the distance and near point.

(*b*) For measuring amplitude of accommodation.

3. In what kind of refractive errors is the fogging system of value? Briefly state how you would examine by this system.

4. In a given case, the vertical lines on the astigmatic dial appear darker with a + 3.00 sph., and the horizontal darker with a + 1.25 sph. Write the prescription in its different forms.

5. Patient requires R. + 3.00 = + 1.75 axis 135°. State fully procedure in obtaining this result with stenopic slit.

6. In refracting, what would guide you in differentiating between —

(*a*) Hyperopia and paralysis of ciliary muscle?

(*b*) Myopia and spasm of ciliary muscle?

7. State fully your procedure in obtaining abduction, adduction, supraduction and infraduction.

8. State fully your procedure in making an examination with the ophthalmoscope —

(*a*) By the direct method.

(*b*) By the indirect method.

9. What do you understand by prism degrees, centrads, prism diopters? Give symbols of each.

10. State fully your procedure in using the perimeter.

11. (*a*) What care should be exercised in prescribing for a hyperope with marked exophoria, a myope with marked esophoria?

(*b*) Will your correction of the refractive error usually correct a hyperphoria of 2°, or should prisms be resorted to?

12. Briefly, yet comprehensively, outline your procedure from the time a patient enters your office until you have completed the examination.

Anatomy.

By William H. Regan, M.D.

1. Name coats of the eye. (Tunics.)
2. Name layers of the cornea.
3. Name structures used in accommodation.
4. Name media that has jelly-like consistency.
5. Name blood supply of cornea.
6. Name eye muscles affected in convergent strabismus.
7. What is glaucoma? Its symptoms.
8. Describe an attack of iritis from an examiner's point of view.
9. Describe the condition known as pannus.
10. Name causes of squint at any age.
11. Why do hypermetropic eyes have more trouble from excessive flow of tears than other forms of refractive errors?
12. Name extrinsic muscles of eye apparatus.

PHYSIOLOGY OF THE EYE.

BY ALBIE W. SYLVESTER, M.D.

1. What are the functions of the following: orbital fat, Tenon's capsule, optic nerve and meibomian glands?

2. Name and give the functions of the various parts which make up the so-called lacrymal apparatus.

3. What direct and reflex stimuli cause an excessive flow of tears?

4. What is meant by the blind spot? What is the most sensitive part of the retina and why?

5. Explain direct and indirect vision. How is each estimated or tested?

6. What are the objective symptoms of paralysis of the sixth cranial nerve? What are the objective symptoms of paralysis of the third cranial nerve?

7. Name and describe those structures of the eyeball whose function is chiefly refractive. Name and describe three structures of the eye whose function is chiefly protective.

8. Explain how physiological dilatation and contraction of the pupil is brought about. Mention two causes of normal dilatation and two causes of normal contraction of the pupil.

9. What are the functions of iris, choroid, retina and zonule of Zinn?

10. Explain in full two theories of accommodation, and explain physiologically the relation of accommodation to convergence.

11. Explain physiologically the condition known as presbyopia.

12. Name the motor muscles of the eyeball and the lids, and give the nerve supply of each.

The Board requires that ten questions be answered in each of the above subjects, and a marking of 65 per cent. is necessary to pass in each. Persons failing in one subject can take the subject again at a future examination, but a candidate who fails in more than one subject must take the entire examination again. In addition to written work the Board requires the examination of a patient so that a satisfactory demonstration of the applicant's ability to apply his theory in practical work may be made. Candidates are also expected to demonstrate their knowledge of frame fitting, neutralizing lenses and transposition of lens formulæ. The Board is constantly endeavoring to make the examinations embrace practical work sufficient to clearly satisfy it that a candidate possesses the essential practical knowledge that a well-equipped refractionist should have.

The Board has held during the year 28 executive sessions. Fifty days have been devoted to the examination of candidates and many hearings have been given. Twenty-one hundred letters have been sent from the Board's office during the year. At the hearings witnesses have been duly sworn and a careful record kept of testimony given.

The Board has particularly endeavored to eliminate methods in practice that are questionable and which border upon fraud and deceit; also the custom of traveling from house to house examining eyes. The Board is pleased to note that its efforts have done much to eliminate these evils. The Board has prosecuted two cases for violation of the optometry law. In one the court found the person guilty and levied a fine of $100, the fine being remitted upon the condition that the man immediately leave the State. The other case was placed on file, upon the condition that the man cease his practice and promptly dispose of all instruments used by an optometrist. Four persons for whom warrants have been sworn out have not yet been apprehended. The Board has periodically employed an agent to assist in its investigations. Members of the Board have endeavored to personally visit practitioners in their offices throughout the State. By this means the Board has been able to come in close contact with those in practice, and many irregularities have been given attention. Country fairs, in former years a fertile ground for optical fakirs, have been visited by the Board, and for the first time the public has been protected from this evil.

The Board is exceedingly gratified to note the great good the optometry law has accomplished in the three years of its existence. As the law contained no exemption clause, every person desiring to continue in the practice was called upon to take an examination before the Board. Wishing to be just to optometrists long in practice, a practical examination only was given, consisting principally of the examining of a patient in the presence of the Board, each applicant being examined separately and given all the time necessary to properly demonstrate his ability. While this method required the expenditure of much time, it appeared to be the fairest means to determine an applicant's competency to continue in the practice. Practically every person, however, prior to appearing before the Board, took special study and instruction. New office equipment has been secured and the raising of the standards of proficiency are very manifest. Optometry colleges are graduating skilled and well-versed practitioners. Several classes for study and research have been formed in different sections of the State, and there exists a commendable spirit of co-operation to meet the more exacting standards. In the brief period of time Massachusetts has enjoyed an optometry law the Board is privileged to report that phenomenal progress has been made.

In July the lease of the suite of offices occupied by the Board at 149 Tremont Street having expired the Board decided not to renew it, owing to the fact that all Class A applicants had been disposed of by June 1, which greatly reduced the work, and the desire to curtail expenses in every possible way. Some of the office furniture and examining equipment was placed in storage, and a small executive office was rented temporarily at 59 Temple Place. Through the courtesy of two members of the Board, who have tendered the use of their private offices for examinations when necessary, and with a committee room at the State House which has also been available, the Board hopes to get along until the new State House extension is ready for occupancy, where the Board will have permanent quarters.

Since June the Board has employed no regular stenographer, depending largely upon a former stenographer for extra clerical assistance. As room has not been available at the State House, the Board has been compelled to pay office rent, although this expense has been materially lessened in the past year by the obtaining of smaller quarters as previously mentioned. The Board has no appropriation from the State, depending solely upon fees derived from examinations. The fees from applicants have been ample to carry on the work of the Board, but now that all the men previously in practice who desired to continue have been examined the receipts have been materially lessened.

The Board now wholly depends upon the fees of new men taking the examinations. This income will be inadequate to permit the Board to carry on its work in a thorough and efficient manner. This same problem has confronted optometry boards in other States. In Arizona, California, Delaware, Florida, Idaho, Indiana, Kansas, Maine, Maryland, Michigan, Minnesota, Nebraska, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota and Utah practitioners must renew their licenses each year at a nominal fee of from $1 to $5. By this method the Board can keep in closer touch with every practitioner, and the law is made self-sustaining, no appropriation from the State being necessary. The Board recommends, therefore, that section 5 of chapter 700, Acts of 1912, be amended by adding the following: —

> Before February first in each year every registered optometrist shall pay to the board an annual license fee of two dollars, in default of which the board may revoke the certificate of any optometrist so in default after a hearing as provided by section eight, but the payment of such fee at or before the time of hearing, with such additional sum, not exceeding five dollars, as may be fixed by the board, shall dismiss said default.

In September John J. Brennan, M.D., of Worcester was appointed to the Board by Your Excellency, and confirmed by the Council, to succeed Albie W. Sylvester, M.D., whose term of office expired at that time. The Board held its annual meeting October 13, as provided by statute. Charles E. Monroe was re-elected chairman and Bernard H. Whitney was re-elected secretary for the ensuing year.

Financial Report.

Receipts.

Unexpended balance in hands of State Treasurer Dec. 1, 1913,	$5,219 12	
Received from 144 applicants for examination,	3,600 00	
Six re-examination fees,	30 00	
		$8,849 12

Expenditures.

Cash paid for compensation and railroad expenses of commissioners,	$5,207 49	
Cash paid for clerical assistance and general office expenses,	2,520 31	
		7,727 80
Unexpended balance in hands of State Treasurer,		$1,121 32

Respectfully submitted,

BERNARD H. WHITNEY, *Secretary.*
CHARLES E. MONROE, *Chairman.*
JOHN J. BRENNAN, M.D.
WILLIAM H. REGAN, M.D.
BRIGGS S. PALMER.

Public Document No. 97

FOURTH ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

NOVEMBER 30, 1914, TO NOVEMBER 30, 1915.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1916.

APPROVED BY
THE STATE BOARD OF PUBLICATION.

MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

Nov. 30, 1915.

1917. CHARLES E. MONROE, *Chairman*, 374 Main Street, Springfield.
1918. BERNARD H. WHITNEY, *Secretary*, 8 Winter Street, Boston.
1920. MATTHEW J. FOWLER, 171 Merrimac Street, Haverhill.
1919. JOHN J. BRENNAN, M.D., 336 Slater Building, Worcester.
1916. WILLIAM H. REGAN, M.D., 15 Beacon Street, Boston.

The Commonwealth of Massachusetts.

REPORT.

Board of Registration in Optometry,
Boston, Nov. 30, 1915.

To His Excellency David I. Walsh, *Governor*.

Sir: — The Board of Registration in Optometry has the honor to submit to Your Excellency its fourth annual report as required by chapter 700, Acts of 1912.

The Board has held during the year three regular examinations. Forty-two candidates were examined, including 14 who had taken previous examinations; of this number, 15 passed and 27 failed. February 9, 10, 11 and 12, 9 candidates were examined, 3 having taken previous examinations; 5 passed and 4 failed; 1 candidate passed in all subjects but one. June 8, 9, 10 and 11, 18 were examined, 4 having been previously examined; 9 passed and 9 failed; 1 passed in all subjects but one. November 9, 10, 11 and 12, 15 were examined, 7 of whom had taken previous examinations; 1 passed, this being the candidate's second examination; 14 failed; 3 were successful in passing all subjects but one. In raising standards the Board added a day to each of the examinations during the year which was devoted to demonstrations and practical work. In addition to the practical work the following written examination was given in November: —

Theoretic Optometry.

By Charles E. Monroe.

Answer *ten only* of the following twelve questions: —

1. Describe the ophthalmometer and give the principle involved.
2. What is the meaning of astigmatism with the rule and against the rule?

3. Is lenticular astigmatism generally with or against the rule?

(*a*) What is the usual amount?

(*b*) How does it affect the findings with the ophthalmometer?

4. Describe the retinoscope, and give the principle involved.

(*a*) Static method.

(*b*) Dynamic method.

5. Describe the respective shadow movement with the plane and the concave mirror, and state the advantage, if any, of the former over the latter.

6. Describe the Stevens phorometer and give principle involved.

(*a*) Maddox rod.

(*b*) Double prism.

7. Describe the ophthalmoscope and give principle involved.

(*a*) Direct method.

(*b*) Indirect method.

Describe the advantages of each.

8. Describe the fogging method and give principle involved.

9. Describe the trans-illuminator; how used and for what purpose.

10. An eye under fog directed to the astigmatic chart of radiating lines, sees the lines corresponding to 10/4 and 9/3 clearest, both being of equal density. What kind of a cylinder would you use to clear them up and make them uniform in shade?

(*a*) At what exact degree would you place the axis of the cylinder?

11. Describe the perimeter, explain its purpose, and the significance of certain findings.

12. How would you handle the following cases: —

(*a*) Hypermetrope of 3 diopters with exophoria of 3 degrees.

(*b*) Hypermetrope of 3 diopters with esophoria of 2 degrees.

(*c*) Myope of 3 diopters with exophoria of 3 degrees.

(*d*) Myope of 1 diopter with esophoria of 3 degrees.

(*e*) Hypermetropic astigmat of O. D.+3.00 cyl. axis 120°; O. S.+3.00 cyl. axis 60°, with cyclophoria?

PRACTICAL OPTOMETRY.

By BERNARD H. WHITNEY.

Answer *five only* of the following seven questions: —

1. Explain various methods of measuring hyperexophoria, hyperesophoria and cataphoria.

(*a*) State fully how you would correct high degrees of same.

2. Describe fully procedure in examining by static retinoscopy.

(*a*) By dynamic retinoscopy.

3. Explain fully use, in an imaginary case, of the following: —

(*a*) Ophthalmometer.

(*b*) Perimeter.

(*c*) Maddox rod.

(*d*) Double prism.

(*e*) Thompson's color stick.

4. Patient requires for distance R+3.75=+2.25 axis 65°. State fully procedure in obtaining this result by stenopic slit.

5. Describe fully use of the ophthalmoscope by the direct and indirect methods.

(*a*) What appearance would you expect in high degrees of myopia, hyperopia and astigmatism?

6. Patient requires R+1.25=+1.87 axis 130°. Explain in detail how to obtain this result by the fogging system.

7. How much esophoria would you expect to find for each diopter of uncorrected hyperopia? How would this influence you in prescribing a correction?

(*a*) Patient has 2 degrees exophoria at distance. What would you expect to find at the near point?

(*b*) What particular kind of muscle imbalance do you usually find it unwise to prescribe a prism correction for, although it is often indicated by your tests?

THEORETIC OPTICS.

BY CHARLES E. MONROE.

Answer *ten only* of the following twelve questions: —

1. A tree 50 feet away forms an image 5 millimeters in height on the retina of an eye, the eye being hypermetropic 3 diopters. What is the actual height of the tree? Give calculation.

2. What are the seven primary colors and how are they obtained? Compare those of greatest and least refrangibility, naming certain properties of each.

3. How much lateral deviation would a ray of light undergo that passed through a 4-degree prism and traveled 2 meters?

4. If parallel light rays pass through a +1 diopter lens and travel 30 inches, what minus lens is required to bring them to parallelism?

(*a*) If parallel light rays pass through a −1 diopter lens, at what distance therefrom must a +1 diopter lens be placed to bring the rays to a focus 60 inches from the latter?

5. If, with the plane mirror before the static eye, the shadow movement is neutralized in the horizontal meridian by +1 diopter lens at 30 inches, and in the vertical meridian by the same lens at 15 inches —

(*a*) What will be the movement at 17 inches?

(*b*) What is the correcting lens?

6. The eyes of fish focus parallel rays of light when in water. What is the refractive condition of such an eye in air?

7. Give index of refraction of the following: flint glass, diamond, water, crown glass, iceland spa, pebble and quartz.

8. A person with an aphakic eye has vision corrected for distance, with a +10 diopter sphere. In order to read at 10 inches with this same lens what is necessary?

9. Which would give the greater amount of illumination, an 8 candle-power lamp 5 feet distant, or a 16 candle-power lamp 10 feet distant, and why?

10. In a certain lens the eye first looks through a point 1 millimeter above the optical center of the lens, and then through a point 1 millimeter to the side of the optical center; the deviation of a distant object is greater in the first case than in the second. What kind of lens is it?

11. An eye accommodates for an object 10 millimeters long, at 10 centimeters from the cornea.

(*a*) What is the size of the retinal image in emmetropia?

(*b*) Hypermetropia of 6 diopters?

(*c*) Myopia of 6 diopters?

12. Does the retinal image increase or decrease in size —

(*a*) When a convex lens is moved outward from the anterior focal point?

(*b*) When a concave lens is moved outward from the anterior focal point?

Physiologic Optics.

By John J. Brennan, M.D.

Answer *ten only* of the following twelve questions: —

1. Differentiate between myopia, hyperopia and astigmatism.

(*a*) Give general appearance of eye in myopia and hyperopia. What causes the differences in appearance?

2. What is meant by second sight in the aged? What causes it? What is its effect on distant vision?

3. What do you mean by color blindness? What colors are most frequently confounded? How much does color blindness interfere with reading? How would you correct it?

4. Compare the direct and indirect method of examination of the fundus with the ophthalmoscope, and tell the advantages of each.

5. How would you demonstrate a paralysis of the right external rectus muscle? (The right eye in this case having the better vision.)

6. How would you detect simulated unilateral blindness or amblyopia?

7. What is nystagmus? What causes it? In general, how successful will you be in correcting it, and why? Is there such a thing as normal nystagmus?

8. In convergent and divergent strabismus, what is the probable error in refraction in each case, and what rule would you follow in regard to strength of correcting lenses used?

9. Define binocular vision.

What are its advantages over monocular vision?

10. What do you mean by relative accommodation? How would you find it?

11. How do you tell the size of a retinal image in any given case?

(*a*) Which is the most apt to cause eye strain, myopia or hyperopia? Why?

12. What do you mean by visual angle? Upon what does its size depend?

PRACTICAL OPTICS.

BY MATTHEW J. FOWLER.

Answer *five only* of the following seven questions: —

1. Transpose the following: —

(*a*) +1.75 cyl. axis 55° = −2.25 cyl. axis 145°.

(*b*) +3.50 sph. = −.75 cyl. axis 15°.

(*c*) −.62 sph. = +1.50 cyl. axis 35°.

(*d*) −2.75 sph. = +1.25 cyl. axis 115°.

2. Give the toric measurements on +6.00 D. base curves of the following: —

(*a*) +.75 sph. = +1.50 cyl. axis 90°.

(*b*) −1.50 sph. = +2.00 cyl. axis 90°.

(*c*) −.50 sph. = −1.00 cyl. axis 180°.

3. Give curves of wafers, adding +1.75 sphere for reading to the above.

4. Patient calls on you to have glasses adjusted. They are spectacles (toric form). The eyelashes touch the lenses, the eyes look 3 millimeters below the upper edges of the lenses, and 5 millimeters in towards the nose from the center of the lenses. Describe in detail how you would rectify this by adjustment so as to make the lenses optically correct.

(*a*) How would you adjust a bridge that was cutting into the nose?

(*b*) By adjustment of the temples, state how you would rectify a pair of spectacles with the right lens lower than the left one.

5. Describe in detail how you would take measurements for spectacles and eyeglasses.

(*a*) Give example of each made up to your measurements.

6. Describe the difference between an ordinary lens and a pebble lens.

(*a*) How would you detect and test a pebble lens?

(*b*) In the following prescription, supply the left distance lens: —

Distance: O. D. −.50 sphere = +1.25 cyl. axis 90°.
O. S.
Reading: O. D. +2.25 sphere = +1.25 cyl. axis 90°.
O. S. +1.50 sphere = +2.00 cyl. axis 105°.

7. Describe the operations in the surface grinding of a lens.

(*a*) The finishing of a cylinder blank into a frameless finished lens.

ANATOMY.

BY WILLIAM H. REGAN, M.D.

Answer *ten only* of the following twelve questions: —

1. Name some drugs and some diseases that cause "toxic amblyopia."
2. Give results of your examination in a case of iritis.
3. Give results of your examination in a case of glaucoma.
4. Differentiate between "stye" and "chalazion."
5. State causes and symptoms of conjunctivitis.
6. Describe the fundus oculi in a case of albumenuric retinitis.
7. Give causes of "squint."

8. Name layers of cornea.
9. Give dimensions of the eyeball.
10. Why is there a condition known as esophoria?
(*a*) Exophoria?
11. Describe contents of the eyeball.
12. Briefly describe the sphenoid bone.

PHYSIOLOGY OF THE EYE.

BY JOHN J. BRENNAN, M.D.

Answer *ten only* of the following twelve questions: —

1. What would be the effect of a pronounced stimulation of the oculomotor nerve?

2. What muscles are used in the following movements of the eye: —
(*a*) Upwards and inwards.
(*b*) Downwards and inwards.
(*c*) Upwards and outwards.
(*d*) Downwards and outwards.

3. Give reaction of pupil in both eyes under following conditions: —
Right eye blind from atrophy. Left eye normal vision.
(*a*) Light thrown into right eye.
(*b*) Light thrown into left eye. Explain your answer by following stimulus through afferent and efferent nerves.

4. Explain part taken by the uveal tract in the visual act?

5. Distinguish between conjunctival and ciliary injection. Arcus senilis. What is it? Where and when found?

6. What do you mean by reflex images on the cornea? How do you distinguish: —
(*a*) Physiological from pathological.
(*b*) Healed process from a progressive one.

7. Explain varying color of the iris. Of what value is this coloring?

8. Why is there so much pain in iritis?
(*a*) Where is this pain located, and why?

9. Describe how products may pass from ciliary body to anterior chamber.

10. What part does the iris play in the formation of the aqueous humor?
(*a*) In effecting resorption from the anterior chamber?
Give your reasons for thinking so.

11. How would you determine differences of level in the fundus.
(*a*) Distinguish between physiologic, glaucomatous and atrophic cup.

12. Show by diagram the shape of the crystalline lens when the eye is at rest and when exercising full accommodation. In which case is the volume of the lens greater?

The Board requires a passing mark of 65 per cent. in each of the above subjects. Candidates failing in more than one subject are required to take the entire examination again.

A number of executive sessions have been held and numerous hearings have been given during the year. The Board has been alert in prosecuting violators of the law, meeting with considerable success, a conviction having been obtained in every court case. Much credit is due the State police for their co-operation.

From careful observation of conditions throughout the State, the Board is pleased to note that the standard of service rendered the public has continually improved, and that the eyesight of the people is being better safeguarded than ever before.

Although the Massachusetts law requires but a two-year course of study, colleges of optometry have constantly raised their standards, and at the present time it is possible to take a four-year course in optometry and receive a degree. Recognizing the present legal status of optometry in Massachusetts, after a number of conferences with members of the Board of Optometry, the State Department of Health in conjunction with the State Board of Education revised their regulations to accord optometrists equal rights with other classes of eye refractionists in the public school system of the Commonwealth.

During the coming month the Board will occupy its new quarters in the State House extension. In the new suite of rooms the Board will have excellent facilities for carrying on its work in an efficient manner. In addition to an executive and clerical office there will be a completely equipped examining room, containing all the scientific instruments used in the practical work given candidates.

The following amendment to the optometry law was enacted by the last Legislature upon recommendation of the Board: —

CHAPTER 201, GENERAL ACTS OF 1915, AMENDING CHAPTER 700, ACTS OF 1912.

Before the first day of February in each year every registered optometrist shall pay to the board an annual license fee of two dollars, in default of which the board may revoke the certificate of any optometrist so in default, after a hearing as provided by section eight; but the payment of the said fee at or before the time of hearing, with such additional sum, not exceeding five dollars, as may be fixed by the board, shall remove the default.

This amendment to the law makes the Board self-sustaining, gives invaluable data for the files, and assures a *bona fide* list each year of optometrists legally authorized to practice in the Commonwealth.

In September Matthew J. Fowler of Haverhill was appointed to the Board by Your Excellency and confirmed by the Council to succeed Briggs S. Palmer, whose term expired at that time.

The Board held its annual meeting October 12, as provided by statute. Charles E. Monroe was re-elected chairman and Bernard H. Whitney was re-elected secretary for the ensuing year.

Financial Report.

Receipts.

Unexpended balance in hands of State Treasurer Nov. 30, 1914,	$1,121 32	
Received from applicants for examination,	650 00	
Re-examination fees,	15 00	
Duplicate certificates,	12 00	
		$1,798 32

Expenditures.

Cash paid for compensation and railroad expenses of commissioners,	$807 48	
Cash paid for clerical assistance and general office expenses,	924 53	
		1,732 01
Unexpended balance in hands of State Treasurer,		$66 31

Note. — Commissioners have received no salaries or traveling expenses since March. Back compensation will be paid from next year's revenue.

Respectfully submitted,

CHARLES E. MONROE, *Chairman.*
BERNARD H. WHITNEY, *Secretary.*
MATTHEW J. FOWLER.
JOHN J. BRENNAN, M.D.
WILLIAM H. REGAN, M.D.

Public Document No. 97

FIFTH ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

November 30, 1915, to November 30, 1916.

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1917.

Publication of this Document
approved by the
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MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

Nov. 30, 1916.

1917. CHARLES E. MONROE, *Chairman*, 374 MAIN STREET, SPRINGFIELD.
1918. BERNARD H. WHITNEY, *Secretary*, 8 WINTER STREET, BOSTON.
1920. MATTHEW J. FOWLER, 171 MERRIMAC STREET, HAVERHILL.
1919. JOHN J. BRENNAN, M.D., 336 SLATER BUILDING, WORCESTER.
1916. WILLIAM H. REGAN, M.D., 15 BEACON STREET, BOSTON.

The Commonwealth of Massachusetts.

REPORT.

Board of Registration in Optometry,
Boston, Nov. 30, 1916.

To His Excellency Samuel W. McCall, *Governor*.

Sir: — The Board of Registration in Optometry has the honor to submit to Your Excellency its fifth annual report, as required by chapter 700, Acts of 1912.

The Board has held during the year three regular examinations. Sixty-seven candidates were examined, including 40 who had taken previous examinations; of this number, 24 passed and 43 failed. On February 15, 16, 17 and 18, 19 candidates were examined, 13 having taken previous examinations; 7 passed and 12 failed; 4 candidates passed in all subjects but one. On June 13, 14, 15 and 16, 30 candidates were examined, 11 having been previously examined; 5 passed and 25 failed; 10 passed in all subjects but one. On November 14, 15, 16 and 17, 18 candidates were examined, 16 of whom had taken previous examinations; 12 passed and 6 failed; 1 passed in all subjects but one. In addition to the practical work, the following written examination was given in November: —

Theoretic Optometry.

By Charles E. Monroe.

Answer *ten only* of the following twelve questions: —

1. Give method of procedure in making a complete optometrical examination of the eyes. State a hypothetical case.

2. Describe and give the underlying principles of the (*a*) ophthalmometer, (*b*) retinoscope, (*c*) ophthalmoscope, (*d*) Maddox rod, (*e*) Maddox double prism, (*f*) pin-hole disc, (*g*) parallax test for muscles, (*h*) cover test, (*i*) stenopeic slit, (*j*) Scheiner's test, (*k*) chromatic test, (*l*) transilluminator, (*m*) Placido disc, (*n*) perimeter.

3. In direct ophthalmoscopy the optometrist whose correction is +2.00 D. sphere = −1.00 cylinder axis 180° finds that with the naked eye he can see the blood vessels in the disc in the horizontal meridian with a +1.00 D. lens in the ophthalmoscope, but requires a +2.00 D. lens to see the blood vessels in the vertical meridian. Write prescription for the eye being examined.

4. The following lenses are placed over the right eye in a trial frame: +2.50 D. cylinder axis 45°, and a +1.75 D. cylinder axis 135°. What single lens from a trial case when held in front of these will make the prescription equal to +3.50 D. sphere = −1.00 D. cylinder axis 45°?

5. How would you find (*a*) the amplitude of accommodation; (*b*) the amplitude of convergence?

6. A myope of 5 D. has 2 D. of accommodation, and wants a pair of glasses for reading music at 20 inches. What would be the power of the glasses so that one-fourth of the power of accommodation is used?

7. What is the strength of a prism corresponding to a 2-degree prism base up, and 7-degree prism base out? How can the angle be found?

8. Give a simple method of decentering oblique cylinders to get a given amount of prism base in or out.

9. When the targets of an ophthalmometer overlap at 120 degrees and separate at 30 degrees, what will be the axis of the minus cylinder required, and why?

10. Why are the movements of the edge of the light reflex in retinoscopy in reversed directions, according as the plane or concave mirror is used?

11. If with a retinoscope (static method) at 16 inches the point of reversal is reached with a +2.00 D. sphere = −1.50 cylinder axis 180°, what would be the prescription for distance?

12. What is the purpose of the fogging method?

PRACTICAL OPTOMETRY.

By Bernard H. Whitney.

Answer *ten only* of the following twelve questions: —

1. A young patient, with +1.25 sphere = +.87 cylinder axis 90° O. U. in trial frame, by dynamic skiametry, plane mirror, fixation at 32 inches, with observation at 25-inch motion is against in all meridians; with observation at 20 inches no motion in 90th meridian; but in the 180th meridian it is noted that the motion is with at the same speed it was against at the 26-inch observation. Write formula for the correcting lenses.

2. By dynamic skiametry, a young patient, without any lenses before the eyes, fixation at one meter, observation at 26 inches no motion in the 180th meridian; observation at 22 inches no motion in the 90th meridian; but with fixation and observation at 15 inches, and a certain lens in position before the patient's eyes, the motion is with in one meridian and

against in the other. Give the lens power and direction of shadow in each meridian.

3. Patient has marked turning of face due to an effort to avoid diplopia. What eye muscles would you expect to find affected when (*a*) face looks to right; (*b*) face looks to left; (*c*) face looks to right and up; (*d*) face looks to left and up; (*e*) face looks to right and down; (*f*) face looks to left and down?

4. Describe a complete phorometer.

(*a*) Explain fully procedure in using each attachment.

5. Patient, thirty-eight years of age, engraver. Complains of headache, and print running together. Refraction, R+1.25 sphere = +.62 cylinder axis 90° O. U. Shows at distance 6 degrees exophoria. Abduction 4 degrees, adduction 8 degrees. How much exophoria would you expect to find at the near point, and write formula of the glasses you would prescribe for close work.

6. What would you expect to find as the amplitude of accommodation in a patient at age of 10 years, 16 years, 20 years, 24 years, 28 years, 36 years, 40 years, 44 years, 48 years, 50 years, 54 years, 60 years?

7. Correction found was R+2.00 sphere = +1.25 cylinder axis 80°. Outline how this result was obtained by static retinoscopy, (*a*) with plane mirror; (*b*) with concave mirror.

8. Patient between fifty and fifty-one years of age. Distance correction R−2.00 cylinder axis 170°; L−2.00 cylinder axis 10°. Write in two forms prescription for probable reading correction.

(*a*) Patient sixty years of age. Distance glasses R−1.12 sphere = −1.75 cylinder axis 105°; L−2.50 sphere = −3.25 cylinder axis 45°. Write in two forms probable prescription for close work.

9. In refracting, what "check" tests can be employed, after the correction has been found, to prove the finding?

10. Under what conditions is a prismatic correction indicated when diplopia is not experienced? Answer fully.

11. Patient twenty-seven years old. Bookkeeper. Refraction O. U. −.75 cylinder axis 180°. Complains of eyeache, which is more pronounced on close work. Distance test shows esophoria of 4 degrees; near test, 1 degree. What would you prescribe?

12. Make out a complete prescription record of a patient's case, — symptoms, instrument findings, etc., — also including all necessary measurements and data so that the glasses could be made therefrom.

Theoretic Optics.

By Charles E. Monroe.

Answer *any ten* of the following twelve questions: —

1. Explain the meaning of the following terms as applied to spherical concave mirrors: (*a*) the pole; (*b*) center of curvature; (*c*) aperture; (*d*) principal axis; (*e*) secondary axis; (*f*) principal focus; (*g*) focal distance; (*h*) conjugate foci.

2. An object one-eighth inch is placed on the axis of a convergent lens of 10-inch focal length. Determine the position, size and character of the image (real or virtual, erect or inverted) when distance from the lens to the object had the following values: (*a*) 30 inches, (*b*) 20 inches, (*c*) 5 inches.

3. A patient who cannot converge his eyes on an object nearer than a meter requires 8 D. lenses, his P. D. being 60 millimeters. How much would the lenses need to be decentered inwards to enable him to see an object at a distance of 25 centimeters with both eyes?

4. Where must an object be placed to obtain a real image four times the size of the object, using a +2.50 D. sphere lens?

5. What will be the height of the image of a 6-foot man on the retina of an emmetropic eye if the man is 100 feet away?

6. An object is placed 9 inches in front of a lens, and an image of this object is formed at 18 inches from the lens on the other side. What is the principal focus of the lens in inches? Make the calculation.

7. What is the rule for figuring the radius of curvature of lenses, the index of refraction being given, and the focal power of the lens?

8. What is light, and how does it manifest itself?

(*a*) When light comes from a luminous point, in what direction does it travel?

(*b*) When light comes in contact with a transparent body what three things happen to it?

(*c*) What is reflection of light, and what will be the angle of reflection when the angle of incidence is 40 degrees?

9. What is meant by index of refraction? Give experiment to find relative index of water.

10. What is the power of a biconcave lens with index of refraction 1.500, whose radii of curvature are 20 centimeters and 30 centimeters?

11. What is the focal length of a lens required by an eye, whose far point is 10 centimeters, in order to see objects at a distance of 25 centimeters?

12. With a candle flame 1 meter distant from two +3.00 D. lenses placed 13 inches apart, where should a screen be placed to get perfect image? Show your steps in the solution.

PHYSIOLOGIC OPTICS.

BY JOHN J. BRENNAN, M.D.

Answer *all* of the following ten questions: —

1. What error of refraction is generally present with a convergent squint? A divergent squint? Explain fully why this is so.

2. What tests would you use to detect heterophoria?

3. Name all error of refraction which may require the use of reading glasses. Give your reasons for recommending them.

4. Define astigmatism. Name the different forms. What methods would you use to detect astigmatism, and how correct it?

5. In the various positions of the eyeball, define the images seen under the following conditions: —

(*a*) Paralysis of right external rectus.

(*b*) Paralysis of left internal rectus.

6. Define visual acuity. What is the standard of visual acuity?

7. What is the size of the retinal image in the following, viz.: —

(*a*) Object 10 meters high, 30 meters away.

(*b*) Object 5 meters high, 50 meters away.

(*c*) Object 1 meter high, 1 meter away.

8. What effect has myopia on accommodation? Hyperopia?

(*a*) Give near point of a hyperope of 2 diopters twenty years old; of a myope.

9. In distant vision, how would you bring accommodation into action? How relax it? How would you increase and decrease convergence?

10. How do we recognize the actual position of any object seen in space?

PRACTICAL OPTICS.

BY MATTHEW J. FOWLER.

Answer *any ten* of the following twelve questions: —

1. Which surfaces of the following lenses should be placed nearer the eye: —

(*a*) +1.50 sphere = +.75 cylinder?

(*b*) −2.00 sphere = +2.50 cylinder?

(*c*) −1.50 sphere = −.50 cylinder?

2. Patient wants eyeglasses. One eye is 3 millimeters nearer the nose than the other eye. Describe mounting you would fit and how it would be made to center.

(*a*) Patient wearing glasses for first time returns same day as fitted, stating that trees and poles are on a tilt. What would you advise?

3. What is the effect of having +6.00 sphere lenses set nearer the eyes in the frames than they were in the test with the trial case lenses?

4. Name and describe five different forms of lenses.

5. Describe how you would center a spherical cylinder lens.

6. A broken lens to be neutralized +3.00 sphere = +1.00 cylinder and you have only sphere lenses to neutralize with; explain how you would do it.

7. What is the dioptric value of the following lenses *combined:* —

(*a*) +.50 cylinder axis 45°?

(*b*) −1.25 cylinder axis 135°?

(*c*) +4.00 sphere = +.75 cylinder axis 135°?

(*d*) −2.00 sphere?

(*e*) +.50 sphere = −1.75 cylinder axis 45°?

(*f*) −1.50 sphere = −.25 cylinder axis 135°?

8. In looking through a lens, how may one decide whether it is a sphere, a cylinder or a sphero-cylinder?

9. Describe the following lenses: (*a*) Crookes glass; (*b*) Luxfel glass; (*c*) Noviol glass; (*d*) Punktal lenses.

10. Explain what a one-tenth 12-carat gold-filled frame consists of.

(*a*) Explain what a 14-carat gold frame consists of.

11. What are the advantages of meniscus lenses over double convex lenses? (1) What kind of lenses would you prescribe to correct the following defects: (*a*) myopia, (*b*) hyperopia, (*c*) myopia combined with astigmatism, (*d*) hyperopia combined with hyperphoria?

12. Transpose the following: —

(*a*) $+.37$ cylinder axis $90 = +.75$ cylinder axis 180°.
(*b*) -1.25 sphere $= 1.75$ cylinder axis 50°.
(*c*) $+.50$ sphere $= -1.12$ cylinder axis 30°.
(*d*) $+1.75$ sphere $= -.62$ cylinder axis 90°.

ANATOMY.

BY WILLIAM H. REGAN, M.D.

Answer *any ten* of the following twelve questions: —

1. Describe the rods and cones of the retina.
2. What difference to eyesight does an abrasion of the epithelial layer of the cornea make?
3. Name the coats of the eyeball and describe the outer coat.
4. What does tension $+3.00$ mean?
5. Describe the iris muscle.
6. Describe the ciliary muscle.
7. Describe the crystalline lens.
8. Describe the choroid.
9. Name the layers of the retina and the most important layer.
10. Why do most young children appear to have large eyes?
11. Give symptoms and appearance of an eye with iritis.
12. Give symptoms and appearance of an eye with glaucoma.

PHYSIOLOGY OF THE EYE.

BY JOHN J. BRENNAN, M.D.

Answer all of the following ten questions: —

1. What are the laws that govern the refraction of light? Compare refractive power of cornea and lens.
2. What are the three subdivisions of the sense of sight? Is the retina equally sensitive in all its parts to these three senses?
3. State function of third cranial nerve. Give its central origin and distribution.
4. What muscles control the reaction of the pupil? Give nerve supply of these muscles, tracing them back to their central origin.

5. In using direct method of examination with ophthalmoscope, what is the probable correction in the following, viz.: —

(*a*) Observer's correction +2.00 sphere, takes +2.00 sphere to see fundus.

(*b*) Observer's correction −2.00 sphere, takes +4.00 sphere to see fundus.

(*c*) Observer's correction −2.00 sphere, takes −2.00 sphere to see fundus.

(*d*) Observer's correction +2.00 sphere, takes −4.00 sphere to see fundus.

6. What would be the effect on vision of a faint opacity covering the entire pupil? A dense opacity in center of pupil? Explain fully.

7. What is meant by spherical aberration? How is this condition overcome in the normal eye?

8. Is a cataract more apt to form in hyperopia or myopia? Why?

9. What is occlusion of pupil? Seclusion? What is the effect on vision?

10. What do you understand by the terms, "lamina cribrosa," "physiologic cup," "myopic crescent?" What is the relation of the retina to the optic nerve?

The Board requires a passing mark of 65 per cent. in each of the above subjects. Persons failing in one subject can take the subject again at a future examination, but a candidate who fails in more than one subject must take the entire examination again.

The Board has been pleased to note the class of applicants taking the examination during the year, the majority being graduates of accredited colleges, including Columbia University, Massachusetts College of Optometry and the Rochester School of Optometry.

During the past year the Board has occupied its new offices in the State House, consisting of an executive office and a model examining room. The latter has been completely equipped with the latest and most modern scientific apparatus known to optometric science, and has materially contributed to the efficiency of the Board in conducting the practical part of examinations. With the facilities for comprehensive practical demonstrations the Board has been enabled to satisfy itself that all applicants who qualify possess the essential theoretic and practical knowledge necessary for well-equipped optometrists in special work as examiners in public schools and institutions or in private practice.

The amendment to the optometry law, requiring an annual registration fee from every registered practitioner, went into effect this year, and aside from the financial benefit derived has proved of great assistance in furnishing correct addresses and other important information, which has enabled the Board to keep its files up to date.

The Board has given considerable thought to the proposition of the consolidation or reorganization of professional boards and commissions in the interest of economy and efficiency as recommended by Your Excellency, and concludes that the consolidation of the Board of Registration in Optometry with other boards would be unwise and undesirable. Such a move would not tend toward economy, and would hamper the present efficiency of a scientific and professional body whose business cannot be properly administered by a composite board or commission.

The practice of optometry has to do with mechanics and physical science, and does not concern either medicine, drugs, embalming or nursing, and should not be controlled either directly or indirectly by those interests.

As constituted, the Board of Registration in Optometry has the necessary scientific knowledge and is in intimate touch with matters pertaining to its particular profession, and has pride and personal zeal in seeing the law administered in such a manner as to both conserve the welfare of the public and assist in the progress and advancement of the profession. The Board, therefore, feels that it would prove disastrous to attempt any substitution for the present satisfactory method of administering the law governing the practice of optometry.

The Board has been energetic in an endeavor to eliminate false and misleading optometric advertising throughout the State, and is glad to report that its efforts have met with a large measure of success.

The Board desires to express its appreciation of the efficient services rendered by District Police Officer Arthur E. Keating, who has been ready to assist in investigating cases of violation of the law and other irregularities.

During the year twelve optometrists have died, making the total number of optometrists registered in Massachusetts, including those who qualified during the past year, 865.

At its annual meeting on October 10 Charles E. Monroe was re-elected chairman and Bernard H. Whitney was re-elected secretary for the ensuing year.

Financial Report.

Receipts.

Unexpended balance in hands of State Treasurer Nov. 30, 1915,	$192 99	
Received from applicants for examination,	675 00	
Re-examination fees,	80 00	
Certificate renewals,	1,714 00	
Excess amount paid,	25	
		$2,662 24

Expenditures.

Cash paid for compensation and railroad expenses of commissioners,	$1,626 51	
Cash paid for clerical assistance and general office expenses,	555 71	
		2,182 22
Unexpended balance in hands of State Treasurer,		$480 02

Respectfully submitted,

CHARLES E. MONROE, *Chairman.*
BERNARD H. WHITNEY, *Secretary.*
MATTHEW J. FOWLER.
JOHN J. BRENNAN, M.D.
WILLIAM H. REGAN, M.D.

Public Document No. 97

SIXTH ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

NOVEMBER 30, 1916, TO NOVEMBER 30, 1917.

BOSTON:
WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
32 DERNE STREET.
1918.

Publication of this Document
approved by the
Supervisor of Administration.

MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

1918. BERNARD H. WHITNEY, *Chairman*, 8 Winter Street, Boston.

1922. HOWARD C. DOANE, *Secretary*, 59 Temple Place, Boston.

1920. MATTHEW J. FOWLER, 171 Merrimac Street, Haverhill.

1919. JOHN J. BRENNAN, M.D., 336 Slater Building, Worcester.

1921. MATTHIAS W. CONROW, M.D., 31 Maple Street, Springfield.

The Commonwealth of Massachusetts.

REPORT.

Board of Registration in Optometry,
Boston, Dec. 31, 1917.

To His Excellency Samuel W. McCall, *Governor.*

Sir: — The Board of Registration in Optometry has the honor to submit to Your Excellency its sixth annual report, as required by chapter 700, Acts of 1912.

The Board has held during the year three regular examinations. Fifty-four candidates were examined, including 29 who had taken previous examinations; of this number, 19 passed and 35 failed. On February 13, 14, 15 and 16, 20 candidates were examined, 14 having taken previous examinations; 5 passed and 15 failed; 3 candidates passed in all subjects but one. On June 12, 13, 14 and 15, 24 candidates were examined; 5 having been previously examined; 10 passed and 14 failed; 5 passed in all subjects but one. On November 13, 14 and 15, 11 candidates were examined, all of whom had taken previous examinations; 4 passed and 7 failed; 2 passed in all subjects but one. In addition to the practical work, the following written examination was given in November: —

Theoretic Optometry.

By Charles E. Monroe.

Answer all ten of the following questions: —

1. A person aged 70 brings you the following prescription for distance vision: O. D. -2 diopters sphere $= +1.50$ D. cylinder axis 90°; O. S. -1 diopters sphere $= +0.75$ D. cylinder axis 90°. Can you improve on the prescription without altering the power? What glasses would you give him for reading at 16 inches?

2. What would you prescribe in the following cases: (*a*) hypermetropia 3 D. with exophoria 3°; (*b*) hypermetropia 3 D. with esophoria 3°; (*c*) myopia 3 D. with exophoria 3°; (*d*) myopia 2 D. with esophoria 2°; (*e*) hypermetropic astigmatism; O. D.+3.50 D. cylinder axis 125°; O. S.+3.50 cylinder axis 55° with cyclophoria?

3. Is lenticular astigmatism with, or against, the rule? (*a*) What is the usual amount? (*b*) How does it affect the findings with the ophthalmometer?

4. When binocular vision with glasses is not so distinct as with either eye separately, what test will show the cause of the imperfect fusion, and what may be done to correct it?

5. What is the rule in regard to fitting a presbyope with glasses?

6. Why is the plane mirror considered best in skiascopy?

7. State why optometric measurements should be both objective and subjective in order to obtain best results.

8. A myope of 5 D. has 2 D. of accommodation, and wants a pair of glasses to read music at 20 inches. What should be the power of these glasses so that one-fourth of the power of the accommodation is in reserve?

9. Patient with hypermetropic astigmatism, under fog; the 10 to 4, 11 to 5 and 12 to 6 lines on the clock dial are best and equally clear. Without lenses before the eye, at what axis should a stenopaic slit be placed to obtain best vision?

10. Describe and give the underlying principle involved in (*a*) the ophthalmometer; (*b*) ophthalmoscope; (*c*) retinoscope; (*d*) transilluminator; (*e*) placido disk; (*f*) maddox rod; (*g*) perimeter; (*h*) parallax test for muscles; (*i*) color test for toxic amblyopia; (*j*) fogging method of refracting.

PRACTICAL OPTOMETRY.

BY BERNARD H. WHITNEY.

Answer ten only of the following questions: —

1. Explain fully the value of the pin-hole disc in subjective testing.

2. How would you ascertain the most exact size of test letters at different distances that would subtend an angle of 5 minutes?

3. Give fully methods of procedure in determining a patient's acuteness of vision.

4. Explain fully what factors govern you in prescribing prisms.

5. In a given case you find hyperopia of 5 D. About what would be the axial shortening of the eyeball?

6. What would you expect a patient to give as the symptoms of myopia? (*a*) Would you expect to find cases of congenital myopia? Explain.

7. What opinion or advice would you give a patient with irregular lenticular astigmatism who desired treatment?

8. Describe the kind of retinoscope you prefer, and explain why. (*a*) Work out an imaginary case by the use of this retinoscope.

9. Describe procedure in testing for achromatopsia (color blindness).

10. In testing accommodation, what is the eye mechanism involved?

11. What is the difference between the direct and the indirect method of using the ophthalmoscope? (*a*) In using this instrument, how would you differentiate between a physiological and a pathological cupping of the disc?

12. What would you expect a patient to give as the symptoms of hyperopia? (*a*) Astigmatism? (*b*) Name and briefly describe all subjective tests for astigmatism.

THEORETIC OPTICS.

BY CHARLES E. MONROE.

Answer all ten of the following questions: —

1. How far must a convex lens of 3 inches focal distance be placed from a candle in order that it may produce a real image of the candle flame three times as large as the flame itself?

2. A lens of unknown power is placed between a candle and a white wall, and moved backward and forward until a perfect image is formed which is smaller than the object. On measurement the image is found to be one-fourth as high as the object, and the total distance between candle and wall is found to be 100 inches. What is the power of the lens?

3. Express in diopters a lens that has a principal focus of 150 millimeters.

4. If light coming from a distance of 20 inches is exactly focussed on the retina with a +3 D. lens, and with the accommodation at rest, what is the kind and amount of refractive error? How do you calculate the result?

5. What is the refractive error in the static eye if the image of an object is 4 millimeters in front of the percipient layer of the retina?

6. What is the size of an object 5 meters away that forms on the retina of a hyperope of 3 D. an image 5 millimeters in diameter?

7. A sphero-cylinder lens is as follows: +5 D. sphere = −1.50 D. cylinder axis 90° is 2 inches in diameter. If a parallel beam of light passes through this lens, find the height and width of the oval patch of light which is cast upon a screen at 15 centimeters distant.

8. With a candle flame 1 meter distant from two +3 D. lenses placed 13 inches apart, where should a screen be placed to get a perfect image? Show your steps in the solution.

9. Having a biconcave lens, it is found that using one surface as a mirror the image of an object at infinity is at 8 inches from the surface, while testing the other surface in the same way the focus is 4 inches. What will be the power of the lens, if the refractive index of the glass is 1.50?

10. (*a*) What is light? (*b*) What is a ray of light? (*c*) What is a pencil of light? (*d*) How does light travel away from a point? (*e*) When

rays of light are going from a luminous point, are they plus or minus? (*f*) In what three ways may light be affected? (*g*) What is a ray of light called before passing from one medium into another? (*h*) What is a ray of light called after it has passed from one medium into another? (*i*) How is light refracted when it passes obliquely from one medium into a denser medium? (*j*) What is the theory of light transmission?

Physiological Optics.

By John J. Brennan, M.D.

Answer all ten of the following questions: —

1. Of what is light composed? How would you find its constituent parts?

2. What is meant by reflection; refraction; visual acuity? What relation does refraction bear to visual acuity?

3. What is meant by "Index of refraction"? What conditions increase or decrease the refractive power of the cornea and lens?

4. What is heterophoria? Name varieties. Which gives the most trouble to patient? To what extent would you correct by glasses?

5. What is binocular vision? What are its advantages? After a successful operation for a traumatic cataract, would you be likely to have good binocular vision?

6. Define concomitant squint. At what age is it likely to manifest itself? Why? What is the probable amount of error and kind in each case?

7. In general, what is the refraction of the eye at birth? What changes are likely to take place as the child grows older? What would you recommend to prevent these changes from taking place or from becoming pathologic? Would you recommend country or city life? Why?

8. At what distance from the eye would diffusion circles be formed on the retina? (*a*) Hyperope 3 diopters twenty-five years old. (*b*) Myope 3 diopters twenty-five years old.

9. How will vision be affected by dilatation of the pupil in (*a*) hyperope; (*b*) myopia; (*c*) astigmatism? Explain. How are convergence and accommodation affected by hyperopia? Myopia?

10. The draft army requires 20/40 and 20/100 uncorrected vision. The wearing of how small a correction would preclude acceptance, age twenty-one to thirty years, inclusive?

Practical Optics.

By Matthew J. Fowler.

Answer all ten of the following questions: —

1. Which increases faster in dioptric power, the distance or reading, when a plus curve is surface ground (*a*) on the disc side of fused bifocal; (*b*) on the opposite side?

2. Which person would be more liable to make a success of wearing bifocals and why: (*a*) A person who moves or rolls the eyes, or one who moves the head? (*b*) Describe how you would recement a wafer.

3. (*a*) Patient wearing strong cylindrical lenses, made and mounted in a round shell frame, states that his glasses were entirely satisfactory the first month, but after cleaning them that morning, vision was very much blurred in right eye. If the frames were not out of adjustment where would you expect to find the trouble?

(*b*) The lenses of a pair of spectacles are in perfect position before patient's eyes, but the bottom edge of the bridge cuts the patient's nose. State just where and in what directions the bends should be made to overcome this trouble and still keep the lenses properly adjusted.

4. (*a*) What does a 10-carat gold frame consist of? (*b*) A 12-carat. (*c*) Which is the better, gold-filled frame one-tenth 12-carat, or one-twentieth 12-carat?

5. Patient wearing eyeglasses complains that the eyelashes touch the left lens. Describe in detail how you would remedy the complaint. (*a*) Give three reasons for advising spectacles.

6. Describe how you would adjust a pair of spectacles that set so low that the pupils of eyes are 6 millimeters above center of lenses. (*a*) State all of the advantages that toric lenses have over flat lenses.

7. Zylonite frame, gold-filled trimmings, zylonite eye broken. (*a*) How would you repair it? (*b*) How would you solder a broken bridge? (*c*) How would you repair a gold temple that opens so it is on a line with the lenses?

8. Give briefly a description of a full equipment for an optometrist's office, including workshop.

9. Transpose the following: (*a*) -3.25 sphere $= +1.50$ cylinder axis 55°; (*b*) $-.62$ cylinder axis $90° = +1.00$ cylinder axis 180°; (*c*) $+1.75$ sphere $= -.87$ cylinder axis 25°. (*d*) What are the curves of the above lenses in toric form?

10. What is an axometer? What is a colmascope?

ANATOMY.

BY WILLIAM H. REGAN, M.D.

Answer ten only of the following questions: —

1. What anatomical changes in an eye are liable to happen after birth?
2. Give cause and result of a traumatic cataract.
3. Bound the crystalline lens.
4. Give nerve supply of the retina.
5. Give blood supply of the retina.
6. Describe layers of cornea.
7. What makes the iris muscle differ in color in people?
8. Describe the optic foramen and give structures that pass through.
9. Name most important layer of retina.
10. What injury to cornea will result in a permanent scar?
11. Describe interstitial keratitis.
12. Name tunics of the eye.

PHYSIOLOGY OF THE EYE.

BY JOHN J. BRENNAN, M.D.

Answer all ten of the following questions: —

1. Name the nerves that supply the iris. Give their function and origin.
2. What is chromatic aberration? How is it overcome by lenses? How does the eye overcome it?
3. What and where are the ciliary processes? What is their function?
4. What is pannus? What causes it?
5. Describe in full reproduction of the aqueous humor after cataract operation.
6. What is meant by consensual reaction of the pupil? What is the effect on pupil of blind eye if light is thrown on good eye, and *vice versa?*
7. Compare the recti muscles for strength. Inferior with superior. Internal with external. Why do eyes get tired in visiting an art gallery?
8. Where in the eye are the rays of light changed into nervous stimuli? Describe this process.
9. Give function of the humors of the eye. Their composition and consistency.
10. Describe normal appearance of fundus as seen by the direct method of ophthalmoscopy.

Conditions brought about by the war are directly responsible for the small number of candidates that appeared for the November examination. In all probability like conditions will prevail for some time. The Board accordingly has voted to eliminate the February examination for 1918, but will hold the regular June examination, which will accommodate those graduating from colleges at that time. It has been the constant aim of the Board to demand high evidences of competency, and that applicants for registration be equipped with practical knowledge as well as versed in theory, and it is determined that certificates be granted only to those who meet these requirements. The Board does not feel justified in the uncertain times at hand in materially raising the standards. The present examination covers a period of four days, the first three devoted to seven written subjects and the fourth day to practical demonstrations. The Board is seriously considering the advisability of adding an extra examination day to be devoted to practical work. The passing mark is 65 per cent. Those failing in one subject may take the subject again at a future examination, but a candidate who fails in more than one subject must take the entire examination again.

About 127 optometrists are eligible for the conscripted army, a large number of whom have already been drafted or have enlisted. In addition, many above the draft age are in the service. Some of these men cannot be reached for the payment of the annual registration fee, which the Board will permit to lapse until the close of the war. The unusual conditions due to the war will probably reduce the usual income, but the Board will endeavor to remain self-sustaining.

The past year has brought but few reports of irregular practices and violations of the law. Several complaints have been made against optometrists in the employ of firms where the business policy has tended to involve the registered optometrists in questionable practices. The Board has adjusted such cases by warning the optometrists that they would be held strictly responsible under their certificates. In addition to the regular examinations numerous executive sessions have been held by the Board, and over 2,500 letters have been sent from its office.

The annual meeting of the Board was held October 12, as prescribed by statute, but adjourned without organization in deference to new members whose appointments were pending before Your Excellency.

To give the Massachusetts Committee on Public Safety additional room, the Board, in conjunction with several other commissions, relinquished its office and model ophthalmic dark room in the State House (Rooms 180, 181), and is temporarily occupying Room 312 M in the new east wing as an executive office. Realizing the demands on space due to war activities, the Board will endeavor to dispense with its examining room by having students take the practical part of the examination at the private offices of Boston Board members.

On November 28 Your Excellency appointed Howard C. Doane of Boston and Matthias W. Conrow, M.D., of Springfield, members of the Board, and they were confirmed by the Council and qualified. At a meeting on December 18 the Board organized by electing Bernard H. Whitney of Dedham chairman, and Howard C. Doane of Boston secretary, for the ensuing year. The Board wishes to record its appreciation of the services of the retiring members, Charles E. Monroe of Springfield and William H. Regan, M.D., of Boston. Charles E. Monroe had served as chairman since the Board was created in 1912, being one of the original appointees. Intensely interested in the development and maintenance of high standards in the optometric profession, of unusual executive ability and professional attainments, he proved an untiring and zealous worker.

During the past year 3 optometrists have died, 6 certificates have been revoked and 19 new men have qualified, making a total of 881 registered optometrists authorized to practice in the Commonwealth.

Financial Report.

Receipts.

Unexpended balance in hands of State Treasurer Nov. 30, 1916,	$480 02	
Received from applicants for examination,	625 00	
Re-examination fees,	55 00	
Certificate renewals,	1,730 00	
Interest,	81	
		$2,890 83

Expenditures.

Cash paid for compensation of commissioners,	$1,284 25	
Cash paid for clerical assistance,	458 00	
Cash paid for car fare and general office expense,	544 96	
		2,287 21
Unexpended balance in hands of State Treasurer Nov. 30, 1917,		$603 62

Respectfully submitted,

BERNARD H. WHITNEY, *Chairman.*
HOWARD C. DOANE, *Secretary.*
MATTHEW J. FOWLER.
JOHN J. BRENNAN, M.D.
MATTHIAS W. CONROW, M.D.

Public Document **No. 97**

SEVENTH ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY

November 30, 1917, to November 30, 1918

BOSTON
WRIGHT & POTTER PRINTING CO., STATE PRINTERS
32 DERNE STREET
1919

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MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY

1920. MATTHEW J. FOWLER, *Chairman*, 171 Merrimack Street, Haverhill.
1922. HOWARD C. DOANE, *Secretary*, 59 Temple Place, Boston.
1919. JOHN J. BRENNAN, M.D., 336 Slater Building, Worcester.
1921. MATTHIAS W. CONROW, M.D., 31 Maple Street, Springfield.
1923. SAMUEL W. BAKER, 297 Union Street, Rockland.

The Commonwealth of Massachusetts

REPORT

Board of Registration in Optometry,
312m, State House, Boston, Dec. 31, 1918.

To His Excellency Samuel W. McCall, *Governor*.

Sir: — The Board of Registration in Optometry has the honor to submit to Your Excellency its seventh annual report as required by chapter 700, Acts of 1912.

Owing to the fact that the war called most young men into the service there have been comparatively few applications for examination this year. Only one examination was held and that in June. Eighteen men took the required examination, including 1 who had taken a previous examination. Of this number 11 men passed and 7 failed. Of the 7 men who failed to qualify 4 passed in all subjects but one. These 4 were later given a special examination before entering the military service and passed, making the total of men passed by the Board and registered to practice optometry during the year 15. In addition to the practical work, the following written examination was given June 11, 12, and 13: —

Theoretic Optometry.

By Howard C. Doane.

Answer any ten of the following twelve questions: —

1. What fundamental principle is retinoscopy based upon? (*a*) Explain fully both static and dynamic retinoscopy.
2. What is the principle of the ophthalmometer? (*a*) What is its value in the equipment of an optometrist's office?
3. Explain the optic phenomenon embodied in the use of the pinhole disc. (*a*) What significant results may it disclose?
4. Why are prisms placed bases in and out respectively in exophoria and esophoria?
5. In an astigmatic eye where would be the circle of least diffusion?

6. Explain the principle of the fogging system of subjective examination of the eye.

7. The size of the image on the retina of an emmetropic eye is 3 millimeters, the object is 250 centimeters distant. What is the size of the object? Give the formula.

8. If at one test minus lenses are indicated and a subsequent test indicates plus lenses, which is correct, and why?

9. Define: (*a*) accommodation; (*b*) punctum proximum; (*c*) amplitude of accommodation; (*d*) relative accommodation.

10. Name the nature of the ametropia under the following conditions: (*a*) When light emerges from the pupil of an eye in divergent lines. (*b*) When light from infinity is focused in front of the retina. (*c*) When lines of the vertical meridian of a clock dial 6 meters distant are focused on the retina, while the horizontal lines are focused behind the retina.

11. How would you determine the size of the visual angle which permits normal vision at a given distance?

12. With a +4.00 D. sphere an eye can read at 20 inches but no further. What would you consider the probable static refraction?

PRACTICAL OPTOMETRY.

BY BERNARD H. WHITNEY.

Answer any ten of the following questions: —

1. Briefly explain construction and use of the Worth Amblyoscope. (*a*) Perimeter. (*b*) Ophthalmometer.

2. Prescription O. D.+1.00 sphere=1 degree prism base in and 1 degree prism base down; O. S.+.75 sphere = 1 degree prism base in and 1 degree prism base up. Write this prescription so that the wholesale optician will have to grind but one prism on each lens.

3. Correction O. D. +2.00 sphere=+.75 cylinder axis 75. Explain and outline how this result was obtained by static retinoscopy. (*a*) By dynamic skiametry.

4. Briefly, yet comprehensively, explain the tests for exophoria at the distant and near points. (*a*) Esophoria. (*b*) Hyperphoria. (*c*) Cyclophoria.

5. Patient, a stenographer twenty-eight years old, has never worn glasses. Examination reveals O. D.+.50 sphere=+.50 cylinder axis 90; O. S.+4.00 sphere = +.50 cylinder axis 90, giving O. D. 20/20; O. S. 20/30. (Left eye turns in slightly at times, she states.) With correction there is a distant esophoria of 3°; near point, 1°; abduction, 3°; adduction, 12°. How would you treat case? What would you prescribe? Explain left vision with correction being poorer than right.

6. Patient's correction is O. D.+.50 cylinder axis 90; O. S.+3.00 sphere=+1.50 cylinder axis 90. Add +2.75 O. U. What is the lens effect when patient looks through reading portion 10° below center of lenses? Exactly how would you correct this condition? Would you prescribe cement bifocals or Kryptoks, and why?

7. Patient is a printer thirty years old. Complains of headache and blurring of type. Examination shows +3.00 sphere = +1.00 cylinder axis 180 O. U., giving 20/20 O. U. Exophoria at distance of 6°; near, 12°; abduction, 5°; adduction, 15°. What would you prescribe? (*a*) Patient twenty-four years old, domestic. Examination shows −1.00 sphere = −.25 cylinder axis 180 O. U., to give 20/20 vision esophoria of 4° at distance; near, 2°; abduction, 3°; adduction, 30°. Complains of headache, particularly at close work. How would you treat the case, and what would you prescribe?

8. Correction found is −3.50 sphere O. U., giving 20/20 O. U. esophoria 6° at distance and 3° at near point; adduction, 16°; abduction, 4°. Patient is a seamstress thirty-eight years old. Outline your treatment of case, and write prescription of lenses you would give. (*a*) Patient fifty-nine years old. Complains of double vision, confusion in walking and inability to read or sew. Examination shows +2.00 O. U. Add +2.75 O. U. Left hyperopia of 5° at distance, also at near point. Ductions uncertain. Explain how you would treat the case, and what you would prescribe.

9. A patient requiring +4.00 sphere = +2.00 cylinder axis 90 O. U. has a P. D. of 60. If the glasses are P. D. 65, what would be the lens effect resulting? Explain. (*a*) If P. D. of glasses was 58.

10. Patient is a paperhanger. Wears +.37 cylinder axis 90 O. U. combined with 1° prism for hyperphoria. If the prism is *not* divided, would you prescribe it base *up* over one eye or *down* over the other? Explain. (*a*) If patient was an engraver.

11. What instructions or directions would you give a child nine years old to develop a faulty fusion sense? Explain fully.

12. How does an uncorrected astigmatism tend to bring about cataract? (*a*) Why, when prisms bases out are prescribed, do they often prove unsatisfactory? (*b*) When, if ever, would you add more than +3.00 for reading to proper distant glasses?

Theoretic Optics.

By Howard C. Doane.

Answer ten only of the following questions: —

1. What is light? (*a*) Describe briefly its cause and effects. (*b*) What are rays of light and how are groups of rays named?

2. Explain how non-luminous objects are rendered visible. (*a*) Give laws of reflection.

3. Give full explanation of the term "index of refraction."

4. How would a ray of light be refracted in passing obliquely from air into water? (*a*) What name would such a ray receive as it leaves the air? (*b*) What two factors govern the refraction of light?

5. What is meant by conjugate foci? (*a*) Under what conditions are conjugate foci not reciprocals?

6. A light wave enters a +4.00 D. lens and after emerging focalizes at

33⅓ centimeters. What is the distance of the source of light from the lens?

7. Name and define the cardinal points of a bi-convex lens.

8. An object 10 inches in height is 20 inches from a +4.00 D. lens. At what distance from the lens would the image be formed, and what is the size of the image? (In answering this, show the formula used.)

9. What is the radius of curvature of a plano-convex 2.50 D. lens, index of refraction being 1.50? Give the rule.

10. Give the rule to find the index of refraction of any substance as compared to air, and illustrate by example.

11. Explain the difference between chromatic and spherical aberration. (*a*) How is chromatic aberration corrected?

12. Transpose the following: (*a*) +2.00 sphere = −.62 cylinder axis 20 into + & + equivalent; (*b*) +1.87 sphere = +1.12 cylinder axis 130 into + & − equivalent; (*c*) −4.75 sphere = +2.25 cylinder axis 15 into − & − equivalent; (*d*) +1.25 cylinder axis 45 = +.75 cylinder axis 135 into sphero-cylinder equivalent; (*e*) +3.25 cylinder axis 125 = −2.00 cylinder axis 35 into sphero-cylinder equivalent; (*f*) −.62 cylinder axis 10 combined with +1.25 cylinder axis 100 into sphero-cylinder equivalent.

PHYSIOLOGICAL OPTICS.

BY MATTHIAS W. CONROW, M.D.

Answer all of the following questions: —

1. What are the differences between monocular and binocular vision? (*a*) To what dangers is a person with one eye subject that one with two eyes is not?

2. Define hemianopsia. (*a*) Homonymous hemianopsia. (*b*) Bitemporal hemianopsia. (*c*) Which is more common?

3. Define chalazion. (*a*) Blepharitis marginalis. (*b*) Hordeolum. (*c*) Xanthelasma.

4. What is Argyll Robertson pupil? What does it signify?

5. What is the principle of the stereoscope, and what use can we make of it?

6. Describe the optic disc in optic atrophy. (*a*) Glaucoma. (*b*) Opaque nerve fiber. (*c*) Papillitis. (*d*) Choked disc.

7. Define cataract, and give four principal varieties.

8. What is astigmia (astigmatism)? (*a*) Which gives greater distress, the lower or the higher grades? Why.

9. Define amblyopia. (*a*) Asthenopia. (*b*) Amaurosis.

10. Diagnosis of aphakia. (*a*) Detachment of retina. (*b*) Partial dislocation of lens. (*c*) What kind of refraction will the aphakic eye have? (*d*) What the dislocated lens?

PRACTICAL OPTICS.

BY MATTHEW J. FOWLER.

Answer all ten of the following questions: —

1. In the prescription O. U.+5.00 combined with +1.00 cylinder axis 90; decentered in 3 millimeters, would this be a base out or base in, and why? (*a*) What is the strength of prism produced by the decentration? (*b*) In what two ways can the power of a prism be determined?

2. What is meant by the axis of a cylindrical lens? (*a*) By optical center? (*b*) By mechanical center?

3. What is the curvature of each surface of a periscopic lens of +3.00 power? (*a*) What is the curvature of each side of a wafer of plus 2 D. fitted to the above lens?

4. With the use of a lens measure the following curves are found: (*a*) Minus surface 6.00 D. plus surface +6.00 and +6.75; (*b*) Minus surface 4.75 D. plus surface +6.00 and +8.00; (*c*) Minus surface 7.00 D. plus surface +6.00 and +7.50. Give the lens values.

5. Describe Crown and Flint glass. Which is generally used in the manufacture of spectacle lenses? (*a*) When will Crown and Flint glass fuse? (*b*) What is the index of refraction of each?

6. What is the dioptric value of the following lenses combined: −1.00 sphere = +3.00 cylinder axis 90, +2.00 sphere = +3.00 sphere; = +2.00 cylinder axis 180, −1.00 cylinder axis 90 = −4.00 sphere = +.50 cylinder axis 180.

7. What are lenticular lenses? What are the advantages and disadvantages of lenticular lenses?

8. Under what conditions would you advise the wearing of Sir William Crookes "A" shade glass? "B" shade glass?

9. Transpose the following: (*a*) −4.00 cylinder axis 45 = +2.50 cylinder axis 135; (*b*) +2.75 sphere = −.62 cylinder axis 105; (*c*) −1.25 sphere = +3.25 cylinder axis 60. Add +2.75 wafer to the above after transposing. What are the curves of the wafers?

10. Describe how you would take measurements for a pair of spectacles. (*a*) For a pair of eyeglasses. (*b*) Give example of the measurements taken for the spectacles and eyeglasses.

ANATOMY.

BY JOHN J. BRENNAN, M.D.

Answer any ten of the following twelve questions: —

1. Describe the orbital cavity. What bones enter into its formation?

2. Describe humors of the eye; their composition, and physical characteristics.

3. Describe the vascular system of the eye.

4. Name motor nerves of the eyeball. How do they enter the orbit?

5. Name changes in lens from childhood to old age.

6. Mention anatomical changes which may give rise to "increase of tension."

7. Distinguish between ciliary and conjunctival injection.

8. Describe the iris.

9. Describe the cornea.

10. Give the various layers of the retina. Which are the most important for the visual act?

11. Describe how the fibers of the optic nerve are distributed after leaving the papilla.

12. Give the origina, course and insertion of the extrinsic muscles of the eyeball.

PHYSIOLOGY OF THE EYE.

BY MATTHIAS W. CONROW, M.D.

Answer all of the following questions: —

1. Define and give functions of Tenon's Capsule. (*a*) Orbital fat. (*b*) Orbicularis palpebrarum muscle.

2. What is meant by "refraction of the eye?" (*a*) What variations of it occur?

3. What is accommodation? (*a*) Describe its mechanism. (*b*) What is convergence? (*c*) How are they associated?

4. What is the "field of vision?" (*a*) What is its examination called? Describe briefly.

5. Give function of rods and cones. (*a*) Relative distribution in retina and the significance of this. (*b*) What are the subdivisions of the "sense of light?"

6. Define mydriasis. (*a*) Miosis. (*b*) When are they physiological? (*c*) When pathological? (*d*) When mechanical?

7. Locate and give functions of retina. (*a*) Sclera. (*b*) Conjunctiva. (*c*) Cilia. (*d*) Supercilia.

8. Describe briefly lacrimal apparatus and its functions. (*a*) Why will violent blowing of the nose sometimes remove a loose foreign substance from the eye?

9. Give the functions of the ocular muscles. (*a*) What muscle's function is to turn the eye upward? (*b*) What downward? (*c*) What upward and to nasal side? (*d*) What downward and to temporal side?

10. Give the functions of the iris. (*a*) Iris pigment. (*b*) Vitreous.

Several cases of violations of the law have been reported to the Board and these have been investigated by the Board and by the State Police. In each case the irregularity has been stopped by proper admonitions from the Board. We are very glad to report this as it shows that the men in our profession are guarding the interests of the public by reporting these men who are not legally qualified to practise. No licenses have been revoked during the year, and general conditions throughout the State are good. The high standard of optometry is being maintained. The Board considered raising the preliminary educational standards, but owing to the war did not feel justified in doing so but will as soon as conditions warrant.

In addition to the regular examination numerous executive sessions have been held by the Board, and over 2,000 letters have been sent from its office.

In the death of Mr. Bernard Hutchins Whitney the Board lost a most valuable member. Appointed by His Excellency Eugene N. Foss in 1913, he served as secretary of the Board four years, and in 1917 was elected chairman, serving until his death. Mr. Whitney's life was devoted to optometry, his chosen profession. His sterling qualities, exceptional ability and unfailing adherence to high ideals won for him a national reputation. His untiring efforts in the cause of optometry was largely responsible for the enactment of the optometry Law in this Commonwealth, and aside from his part in the administration of the law during his term of office, he was instrumental in placing and maintaining optometry on a high plane among the professions. The Commonwealth has lost an efficient servant, and optometry a recognized leader.

The annual meeting of the Board was held October 8, as prescribed by statute. Matthew J. Fowler of Haverhill was elected chairman, and Howard C. Doane of Boston was reelected secretary. On October 9 Your Excellency appointed Samuel W. Baker of Rockland as a member of the Board, and he was confirmed by the Council and qualified.

Many young men returning to civil life the coming year will undoubtedly necessitate the usual number of examinations. The Board anticipates an active year.

During the year 4 optometrists have died, and 15 new men have qualified, making a total of 886 optometrists authorized to practise in the Commonwealth.

We respectfully call Your Excellency's attention to the following financial report which shows a substantial unexpended balance. The Board has carefully considered all expenditures endeavoring to conserve the funds in every way possible without crippling the proper administration of the optometry law.

Financial Report.

Receipts.

Unexpended balance in hands of State Treasurer Nov. 30, 1917,	$603 62	
Received from applicants for examination,	400 00	
Re-examination fees,	20 00	
Certificate renewals,	1,753 00	
Interest,	1 09	
		$2,777 71

Expenditures.

Cash paid for compensation of commissioners,	$701 43	
Cash paid for clerical assistance,	423 00	
Cash paid for car fare and general office expense,	358 26	
		1,482 69
Unexpended balance in hands of State Treasurer Nov. 30, 1918,		$1,295 02

Respectfully submitted,

MATTHEW J. FOWLER, *Chairman.*
HOWARD C. DOANE, *Secretary.*
SAMUEL W. BAKER.
JOHN J. BRENNAN, M.D.
MATTHIAS W. CONROW, M.D.

Public Document **No. 97**

EIGHTH ANNUAL REPORT

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY

November 30, 1918, to November 29, 1919

BOSTON
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approved by the
Supervisor of Administration.

MEMBERS

OF THE

MASSACHUSETTS BOARD OF REGISTRATION IN OPTOMETRY.

1920. MATTHEW J. FOWLER, *Chairman*, 171 Merrimack Street, Haverhill.
1922. HOWARD C. DOANE, *Secretary*, 59 Temple Place, Boston.
1921. MATTHIAS W. CONROW, M.D., 31 Maple Street, Springfield.
1923. SAMUEL W. BAKER, 297 Union Street, Rockland.
1924. F. JULIUS QUIST, M.D., Park Building, Worcester.

The Commonwealth of Massachusetts

REPORT.

BOARD OF REGISTRATION IN OPTOMETRY,
312M, STATE HOUSE, BOSTON, Dec. 1, 1919.

To His Excellency CALVIN COOLIDGE, *Governor*.

SIR: — The Board of Registration in Optometry has the honor to submit to Your Excellency its eighth annual report as required by chapter 700, Acts of 1912.

The board has held during the year three regular examinations. Fifty-three candidates were examined, including 20 who had taken previous examinations. Of this number, 11 passed and 42 failed. On February 18, 19, 20 and 21, 7 candidates were examined, including 2 who had taken previous examinations. Not one was successful. Three passed in all subjects but one, and 4 failed. On June 10, 11, 12, and 13, 27 candidates were examined, 6 having been previously examined; 5 passed and 22 failed; 12 passed in all subjects but one. On November 18, 19, 20 and 21, 19 candidates were examined, 12 having been previously examined; 6 passed and 13 failed; 9 passed in all subjects but one. In addition to the practical work, the following written examination was given June 10, 11, 12 and 13, 1919.

THEORETIC OPTOMETRY.

BY S. W. BAKER.

Answer ten only of the following twelve questions: —

1. With a schematic eye for 1 D. myopia, what lens would be needed to produce artificially -1.25 sphere $= +2.00$ cylinder axis 45° at 20 inches?

2. Would a person with color blindness have poorer or better vision than one who does not have this trouble?

3. Why do astigmatic axes change in some eyes and not in others?

4. Which position of the stenopaic disc renders the perpendicular lines of the fan dial most distinct in hyperopic astigma against the rule?

5. Describe the four methods in skiametry: (*a*) static; (*b*) dynamic; (*c*) fogging; (*d*) prism.

6. Describe two subjective methods for measuring astigma with spherical lenses.

7. In using the ophthalmoscope, indirect method, you desire a magnification of five diameters. What is the power of the objective lens used?

8. A patient is 3 D. hyperopic. How can you verify it with a retinoscope, plane mirror, and a +6.00 D. lens?

9. How much more primary convergent adduction does a person with P. D. of 60 millimeters use at 16 inches than a person with a P. D. of 52 millimeters?

10. A prism of 5° at axis 60° is placed before the eye. What is the power of the prism at axis 180?

11. Show geometrically the action of the lens system in a telescope tube of an ophthalmometer when you are observing the reflected mires?

12. Can or does anaphoric and hyperphoric conditions exist in a person's eyes at the same time?

Practical Optometry.

By H. C. Doane.

Answer any ten of the following twelve questions: —

1. Describe clearly the appearance of a physiological fundus upon examination with ophthalmoscope. (*a*) What indications would this instrument give as to errors of refraction, and how determined, using direct method?

2. Describe a complete modern phoro-optometer. (*a*) Explain fully method of using each attachment.

3. Upon what fundamental principle (law of optics) is skiametry based? (*a*) Give in detail both static and dynamic methods of skiametry as you understand them.

4. What is meant by accommodative esophoria? (*a*) Give in detail your procedure in determining whether this condition exists.

5. Would you give full correction under following conditions: Hyperopia with exophoria? Hyperopia with esophoria? Give reasons.

6. What is meant by amplitude of accommodation? (*a*) How would you determine the amplitude in the following conditions: Emmetropic eye? Hyperopic eye? Myopic eye?

7. Describe fully the possible causes of astigmatism. (*a*) Give in detail both objective and subjective methods of determining kind and amount of astigmatism. (*b*) How do you ultimately decide the correct axis of astigmatism?

8. Under what conditions would you never prescribe concave lenses?

9. Give the technique in the use of the following instruments: (*a*) ophthalmometer; (*b*) perimeter; (*c*) ophthalmoscope, direct and indirect methods; (*d*) Jackson cross-cylinder.

10. What do you understand is the normal relation between accommodation and convergence? (*a*) How would you determine this relation? (Give procedure with instruments used.)

11. A bookkeeper, age twenty-five. P. D. 60. Wearing O. D. +2.00 sphere = +1.50 cylinder axis 60; O. S. +3.00 sphere = +2.00 cylinder

axis 110 in spectacles measuring P. D. 65. Complains of fatigue after close work. Upon examination prescription is found correct for each eye. Muscle tests show exophoria at distance, 4°; at near, 8°. Right hyperphoria, 2°. What is the probable cause of discomfort, and how would you handle such a case?

12. Give methods of testing presbyopia, objective and subjective. (*a*) How do you test for muscle imbalance at the near point? (*b*) With O. U. 8 D. spheres in the trial frame, patient reads at 13 inches. What will be the effect in placing this ℞ in a frame which brings the lenses closer to the eyes?

THEORETIC OPTICS.

BY S. W. BAKER.

Answer ten only of the following twelve questions: —

1. What is a virtual focus?

2. The velocity of light passing through a quartz crystal is 5–9 of that of air. Give the index of refraction.

3. How is it known and recognized that invisible wave-lengths exist at each end of the spectrum?

4. If a −6 D. base curve is to be put upon glass of an index of 1.523, but the tool is incorrectly made for glass of an index of 1.53, what will be the value of the base curve which this glass will give?

5. A Kryptok toric lens is ground for distance +.50 sphere = +.75 cylinder axis 90 with a +1.50 segment added for near vision, index of distance glass 1.523, of segment 1.5886. Give the power of the anterior and posterior curves of the segment.

6. What is the meaning of: (*a*) wave-length; (*b*) wave-front; (*c*) wave-value; (*d*) short waves; (*e*) long waves; (*f*) plane waves; (*g*) curved waves?

7. Draw a single prism whose angles are 30°, 60° and 90°.

8. Two plane mirrors are in a vertical position set at an angle of 72°. A lighted candle is placed equidistant between them. How many images of the candle are visible in the mirrors?

9. Which has the greater illumination on a wall, and how much more, a 30 C. P. light at 3 feet away, or a 20 C. P. light at 2 feet away?

10. Two mirrors, one convex and the other concave, each with a 12-inch radius, are placed in a position facing each other, 72 inches apart. An object 12 inches high is placed between them, 42 inches from the concave and 30 inches from the convex. What is the size of the image in each of the mirrors?

11. Lenses in series: —

0 20″ +7 10″ +10 10″ +6 6″ −8

: : : :

Locate image.

12. A camera has a 6-inch lens. How far away must the object be placed so that the picture on the negative will be $\frac{1}{3}$ its size?

Physiology and Physiological Optics.

By M. W. Conrow, M.D.

Answer ten only of the following twelve questions: —

1. Give the functions of the extrinsic ocular muscles.

2. What palpebral muscle has an anatomical connection with one of the orbital muscles, and what is its function?

3. Define accommodation and convergence. What is their relation? What effect has age on accommodation?

4. What condition would you suspect if a person over fifty years, who has been wearing correctly prescribed plus lenses, should now require much weaker or minus lenses? How would you verify your conclusion?

5. What is the blind spot? How can you demonstrate it? Why are we not conscious of it under ordinary conditions?

6. What is diplopia and its ocular causes? Is it always manifested when present? Give reason.

7. Give varieties of heterophoria. Which variety is most often associated with hyperopia; with myopia?

8. Define cataract. Name and define principal varieties.

9. What is the scientific name for eyestrain? From an occupational standpoint, what classes of people are most and least subject to it?

10. Give the functions of tarsal cartilage, meibomian glands, lacrimal glands, cilia.

11. Give the functions of cornea, aqueous humor, iris, pupil, crystalline lens, vitreous humor.

12. A man of sixty years or over is aphakic in one eye. With a +10 lens he gets 20–20 vision in that eye. With the other eye, which is emmetropic and normal, he gets 20–20 vision also. What would you do for him, and why?

Practical Optics.

By M. J. Fowler.

Answer all ten of the following questions: —

1. A broken lens required a −2.50 sphere to neutralize the vertical meridian and a +.75 sphere to neutralize the horizontal meridian. Write two prescriptions for this compound lens.

2. (*a*) What difference would you make in the adjustment of a spectacle frame for reading and one for shooting? (*b*) Give three causes of the cutting of the nose by a spectacle bridge. (*c*) How can the trouble be rectified in each case?

3. What amount of power on each surface of a wafer +2.75 sphere added to distance lens in cement bifocal, the distance lens being +.50 sphere = + 1.00 cylinder 6 curve toric?

4. (*a*) Explain by diagram six different kinds of lenses. (*b*) State what error or refraction each is used to correct.

5. What is the dioptric power of these lenses: (*a*) 30 inches; (*b*) 18 inches; (*c*) 26 inches; (*d*) 7 inches; (*e*) 2½ inches?

6. (*a*) What is meant by axis of cylindrical lens? (*b*) What is meant by optical center of lens? (*c*) What is meant by mechanical center of lens?

7. (*a*) Describe in detail the operations in the surface grinding of a lens. (*b*) Describe in detail the operations of finishing a sphero-cylinder blank into a frameless spectacle lens.

8. (*a*) Give a description of a full equipment for an optometrist's office. (*b*) Give a description of a full equipment for an optical workshop.

9. With the use of a lens measure, the following curves are found. Give the lens values: (*a*) Minus surface 5.50. Plus surface 6.00 and 6.75. (*b*) Minus surface 6.00. Plus surface 8.00. (*c*) Minus surface 6.75. Plus surface 6.00 and 8.50.

10. (*a*) What is a Kryptok lens? (*b*) What is a colmoscope? (*c*) What is an axometer?

ANATOMY.

By J. J. BRENNAN, M.D.

Answer ten only of the following twelve questions: —

1. Name the extrinsic muscles of the eyeball. Give their origin and insertion.

2. Mention the three excavations of the optic nerve. How distinguish between them?

3. Describe the conjunctiva of eyeball and lids.

4. What is ptosis? What causes it?

5. Describe the middle tunic of the eye.

6. Name the motor and sensory nerves of the eye. Give their origin and distribution.

7. What symptoms would make you suspect glaucoma?

8. What is a cataract? What would make you suspect an incipient cataract?

9. Describe ciliary body. Process. Muscle.

10. Differentiate between stye and chalazion.

11. Describe the cornea.

12. Define tension of the eyeball. How is it measured? How maintained?

The Board has maintained the usual high standard, requiring a passing mark of 65 per cent in each subject. A candidate failing in one subject only is required to take only that subject at a subsequent examination, but failing in more than one subject he is required to take the entire examination again. Realizing the importance of practical demonstrations in the use of instruments and methods to determine a candidate's qualifications, the Board has required a high standard of proficiency. This has been possible this year by a partial return for our use of the model examination room in the State House, which had been dismantled when the rooms formerly occupied by the Board were relinquished to the Massachusetts Committee on Public Safety in 1917.

During the year the Board has been active in investigating, with the assistance of Officer Arthur E. Keating of the State Police, numerous reports of irregular practices and violations of the law. Several cases have been adjusted by proper warnings. Two cases of open violation of the law by practicing without a license have been prosecuted, and the violators convicted and fined.

We respectfully call Your Excellency's attention to the financial report. The Board has made every effort to economize, and by curtailing expense for clerical assistance and office supplies we are able to show a substantial unexpended balance.

The Board has given much time and thought to several suggested changes in the optometry law, chapter 700 of the Acts of 1912, and has submitted two bills, together with concise reasons for the recommended amendments. In compliance with the provisions of chapter 131 of the General Acts of the year 1919, copies of these bills have been sent to the Secretary of the Commonwealth.

Recommendations.

1. The optometry law now provides that two members of the Board shall be oculists registered under the laws of the Commonwealth governing the registration of physicians. As this law pertains only to the practice of optometry as defined in section 1 of the law, it is recommended that section 2 of chapter 700 of the Acts of 1912 be amended as drafted in section 1 of House Bill No. 113.

2. As the Board finds it necessary to make rules and regulations from time to time to properly execute the law, we recommend that section 4 of chapter 700 of the Acts of 1912 be amended as drafted in section 2 of House Bill No. 113.

3. As the standards of educational requirements are being raised in other professions, and in order to place optometry on an equally high plane and also to require optometry schools to maintain standards satisfactory to the Board, we recommend

that section 5 of chapter 700 of the Acts of 1912 be amended as drafted in section 3 of House Bill No. 113.

4. That the Board may have more definite means of locating registered optometrists and to more positively protect the public from fraud and misrepresentation, we recommend that section 6 of chapter 700 of the Acts of 1912 be amended as drafted in section 4 of House Bill No. 113.

5. To further protect the public by notifying the city or town clerk of the revocation of a registered optometrist certificate, we recommend that section 8 of chapter 700 of the Acts of 1912 be amended as drafted in section 5 of House Bill No. 113.

6. As there is no provision for increased penalties of a second violation of the law, we recommend that section 9 of chapter 700 of the Acts of 1912 be amended as drafted in section 6 of House Bill No. 113.

7. Having recommended that the Board shall consist of optometrists, we recommend that the provision regarding oculists be stricken from section 10 of chapter 700 of the Acts of 1912 and amended as drafted in section 7 of House Bill No. 113.

8. In order to define clearly the language of the law we recommend the addition of section 11 as drafted in section 8 of House Bill No. 113.

9. To provide for re-registering of an optometrist who has temporarily retired from practice or removed from the Commonwealth for a period not exceeding five years, we recommend that chapter 201 of the General Acts of 1915 be amended as drafted in section 9 of House Bill No. 113.

10. Owing to the increase in railroad rates, the present provision of the law allowing 3 cents per mile for traveling expenses is inadequate. In order to place the compensation of the Board members on a salary basis instead of per diem compensation, we recommend that section 7 of chapter 700 of the Acts of 1912 be amended as drafted in section 1 of House Bill No. 114.

On October 8 Your Excellency appointed F. Julius Quist, M.D., of Worcester a member of the Board, and he was confirmed by the Council and duly qualified. At the annual meeting on October 14, as prescribed by statute, the Board organized for the ensuing year by re-electing Matthew J. Fowler of Haverhill chairman and Howard C. Doane of Boston secretary. The Board wishes to record its appreciation of the untiring, faithful service of the retiring member, John J. Brennan, M.D., of Worcester.

During the past year 9 optometrists have died, and 11 men have qualified, making a total of 888 registered optometrists in Massachusetts.

FINANCIAL REPORT.

Receipts.

Unexpended balance in hands of State Treasurer Nov. 30, 1918,	$1,295 02	
Received from applicants for examination,	850 00	
Received from re-examination fees,	35 00	
Received from certificate renewals,	1,734 00	
Interest,	1 30	
		$3,915 32

Expenditures.

Cash paid for compensation of commissioners,	$1,230 00	
Cash paid for clerical assistance,	453 50	
Cash paid for car fare and general office expense,	269 92	
		1,953 42
Unexpended balance in hands of State Treasurer Nov. 30, 1919,		$1,961 90

Respectfully submitted,

MATTHEW J. FOWLER, *Chairman.*
HOWARD C. DOANE, *Secretary.*
MATTHIAS W. CONROW, M.D.
SAMUEL W. BAKER.
F. JULIUS QUIST, M.D.

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